Examples of praise for Jeff Schmidt's work at *Physics Today*, from...

- Physicist who became presidential science advisor
- Nobel prize laureates
- Prominent physicists
- Executive Director and CEO of American Institute of Physics (prior to Marc Brodsky)
- Editor of *Physics Today* (Schmidt's supervisor)

University of Illinois at Urbana-Champaign

College of Engineering
MATERIALS RESEARCH LABORATORY
104 S. Goodwin Ave.
Urbana, Illinois 61801
(217) 333-1370

May 14, 1982

Dr. Tom von Foerster
PHYSICS TODAY
335 East 45th Street
New York, New York 10017

Dear Tom:

After sampling my approximate need, I would like to order 500 reprints of my PHYSICS TODAY article entitled, "Thermodynamics of Excitons in Semiconductors." This would include black-and-white article with four-color cover. Since the article is 8-1/3 pages, I estimate from your guideline sheet that the charge would be $110 + 4 x $17 = $178 plus cover at $230 + 2 x $26 = $282 for about $460 total cost, plus some cost for 200 covers you now have. If this estimate is far off, let me know; otherwise, please initiate the order.

I am very pleased with the final product. The cover photo reproduced very well and the article and figures came out nicely. I was pleased with the interest and knowledgeability of Jeff Schmidt, whose thorough reading of the manuscript and interest in the material helped to make the article more readable. Thanks.

Sincerely,

Jim Wolfe
Professor of Physics

JW:dj

RECEIVED
MAY 21 1982
PHYSICS TODAY

Yale University
A. W. Wright Nuclear Structure Laboratory
272 Whitney Avenue, P.O. Box 6666, New Haven, Connecticut 06511

T. F — What do you think?

RECEIVED
SEP 6 1983
PHYSICS TODAY

D. Allan Bromley
Henry Ford II Professor
and Director
203-436-3026

August 24, 1983

Dr. Harold Davis, Editor
PHYSICS TODAY
American Institute of Physics
333 East 45th Street
New York, New York 10017

Dear Hal:

As you know, I maintain concern that nuclear physics gets adequate coverage in Physics Today. I write at this time to bring to your attention the possibility that two of my former colleagues, Robert J. Ascuitto and Ernest J. Seglie, might be invited to prepare a paper on Grazing Collisions of Atomic Nuclei for publication in your journal. I have talked with them about this, and at my request, they have prepared a very general sort of talking outline which I enclose. It actually seems to me that this particular outline is much more appropriate for Scientific American than for Physics Today, but Bob and Ernie are the two guys who, perhaps more than anyone else, contributed to our understanding of these collisons and what they can tell us about the underlying dynamics and structure of nuclei. They can write a very elegant article for you. Since it turns out that both of them have won very significant awards for excellence in teaching and clarity in writing, and I think that you and your people would enjoy working with them.

Although both are excellent nuclear physicists, Bob Ascuitto is presently completing his residency in pediatrics at the Univeristy of Connecticut Medical Center, and Ernie Seglie is a senior staff officer at the Institute for Defense Analysis in Washington. Together, they were members of the Physics Department here at Yale for a number of years. In Bob Ascuitto's case, I made the mistake, as Chairman of the Department, of assigning him to teach medical physics to undergraduates. He became so intrigued by this that he decided to undertake a medical program at our medical school in parallel with his duties as an Associate Professor of Physics. Not only did he score at the top of his entire class but also during his last year of the program, he generated five Physical Review Letters which is no mean feat for someone working full-time at physics. In short, he is a very unusual individual.

He and Seglie have worked together for many years and have just completed a major chapter for me as part of a treatise on heavy ion science that Plenum Press is publishing. It will be the definitive work on these grazing collisions for a great many years to come, and it is on that basis that I feel quite confident in recommending them to you for a Physics Today article.

I am contacting you at their request and have told them that I have forwarded the outline to you. If you have some interest in this, just drop me a note or give me a call at 203-436-3026 and I will put you in touch with the two of them directly.

In the meantime I must tell you that Jeff Schmidt did an absolutely outstanding job in editing the paper I had prepared on Neutrons in Science and Technology for presentation at the 40th Anniversary of Fermi's First Reactor at the University of Chicago. I made no changes whatsoever in what he had done. You really do not know how unusual that is because, almost inevitably, I end up having giant hassles with editors who work over my papers. Let me then put in a very strong plug for Jeff.

With warmest personal regards.

Sincerely yours,

allan
(MBS)

D. Allan Bromley

DAB:lal

He and Seglie have worked together for many years and have just completed a major chapter for me as part of a treatise on heavy ion science that Plenum Press is publishing. It will be the definitive work on these grazing collisions for a great many years to come, and it is on that basis that I feel quite confident in recommending them to you for a Physics Today article.

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With warmest personal regards.

Sincerely yours,

allan
(mrs)

D. Allan Bromley ← Became the President's Science advisor

DAB:lal

Yale University
A. W. Wright Nuclear Structure Laboratory
272 Whitney Avenue, P.O. Box 6666, New Haven, Connecticut 06511

RECEIVED
FEB 13 1984
PHYSICS TODAY

MS #

D. Allan Bromley
Henry Ford II Professor
and Director
203-436-3026

February 7, 1984

Harold L. Davis
Physics Today
335 East 45th Street
New York, New York 10017

Dear Hal:

You sent me a copy of a letter from Larry Cranberg dated January 23rd which you were proposing to publish. I am enclosing herewith an answer that you may wish to publish along with the Cranberg letter.

Your people did an excellent job in condensing the paper and I have received many very positive comments concerning it.

With all best wishes.

Sincerely yours,

Allan

DAB:mts

Enc.

UNIVERSITY OF OREGON

May 14, 1984

Jeff Schmidt
Associate Editor
Physics Today
335 East 45 Street
New York, NY 10017

Dear Jeff:

With reference to your letter of May 9 and my telephone reply, I want to put in writing how very grateful I am for the superb editing job that you did on our article on atomic physics with synchrotron radiation. I wish I could write like that!

Will it be possible to order a few reprints, or extra copies of the June issue?

With best regards,

Sincerely,

Bernd

Bernd Crasemann
Professor of Physics

BC:sh

DEPARTMENT OF PHYSICS • COLLEGE OF ARTS AND SCIENCES • 122 SCIENCE I • EUGENE, OR 97403-1274 • (503) 686-4751

*An Equal Opportunity, Affirmative Action Institution*

The American Physical Society

335 EAST 45TH STREET
NEW YORK, N. Y. 10017

Orig EAS
WKH
To
LRB
ER

Date 20 August 1984

To Harold Davis

Msg: QGIE-1878-7730 PT.

From Mildred Dresselhaus

- ☐ for your recommendation
- ☑ for appropriate action
- ☐ for your information
- ☐ to note and return
- ☐ at your request
- ☐ for your file

Orig EAS WHH To LRB ER

Posted: Sun Aug 19, 1984 4:33 PM EDT Msg: QGIE-1878-7730 P.T.
From: MDRESSELHAUS
To: WHavens
CC: MDresselhaus
Subj: Message to Physics Today

1. I reviewed the article by
Beasley and Geballe and am
sending my copy to you by
Federal Express. The article
is in good shape basically.
2. I found the article by
Fritzsche in my pile eventually.
I have also reviewed that article.
I am pleased with the improvements
that have been made and feel that
it will be an effective article
in Physics Today.
3 . Please be in touch with me on the
remaining items in the issue.
I will be back at MIT on Tuesday
8/21.
Cheers
Millie.

Action?

Command? r2

The University of Wisconsin – Milwaukee

LABORATORY FOR SURFACE STUDIES
DIRECTOR: David S. Y. Tong

MILWAUKEE, WISCONSIN 53201
PHONE: (414) 963-5765, 4474

October 29, 1984

Dr. Harold L. Davis, Editor
Physics Today
335 East 45th Street
New York, NY 10017

Dear Harold:

Just a note to let you know that since the publication of my article, "Exploring Surface Structure" in Physics Today, I have received many responses. Most of the responses are from people that I have never met. This indicates how popular your journal is. One response characterized Physics Today as a "widely read and influential" journal.

I would like to take this opportunity to thank you for asking me to write the article. Also, I would like to thank Jeffrey Schmidt for his excellent editing work.

On the other hand, some comments from colleagues complain that their names or work were left out of the article. Incidentally, most of the complaints came from West Germany (I do not know the significance of this). I remember the difficult hours Jeffrey and I spent on cutting out names and paragraphs from the original draft. However, it is difficult to convince a colleague that a non-expert cannot care less for a name. They point out that department chairmen and industrial managers read these articles to judge the performance of their staff.

Surface structure is an active and dynamic area. Of the 26 surface techniques that I discussed in the article, I feel many of them deserve full length articles in your journal. I would support such future articles to be written by various authors.

Finally, I have ordered reprints and complimentary copies but have not yet received them. Could someone check on this for me please?

With best regards,

Yours sincerely,

S. Y. Tong

RECEIVED
NOV 7 1984
PHYSICS TODAY

SYT:da

THE UNIVERSITY OF ARIZONA
TUCSON, ARIZONA 85721
602/621-6970
LUNAR AND PLANETARY LABORATORY

February 22, 1985

Mr. Jeff Schmidt, Assoc. Editor
PHYSICS TODAY
335 E. 45th St.
New York, NY 10017

Dear Jeff:

With this letter I thank you for your help with the article on asteroids and comets in the February issue. I have had much editing experience myself, for the Space Science Series books of the University of Arizona Press, and it is through this training that I can appreciate the exceptional job you have done.

There was a considerable amount of rewriting that you guided me into patiently and the article is much better than my original version. Your thinking through the material and your questions step by step have actually clarified the material for me; where I had made a statement carelessly you would bring me up and bring about a clearer version.

I also admire your patience. Until the very end, with the material already set, I kept asking you for additions and changes because the field is changing so fast. You allowed all of these and I am most grateful.

If you ever want to move out West, we would love to have you at the Press and we could surely use your competence.

With best regards,

Tom Gehrels

TG/sm
cc: Dr. H. L. Davis

P.S. Would you have a few reprints of the article or a few February issues for me? As we discussed on the phone, I would now like to send this to the Soviet Union where there is an interest in publishing a translated version of the article.

COPY TO
GLORIA 2 OCT. 85 V

W.W. HANSEN LABORATORIES OF PHYSICS
STANFORD UNIVERSITY
STANFORD, CALIFORNIA 94305-2184

Edward L. Ginzton Laboratory
High Energy Physics Laboratory

Telephone (415) 497- 0213

September 23, 1985

Mr. Jeff Schmidt
Associate Editor
Physics Today
335 East 45 Street
New York, N.Y. 10017

Dear Mr. Schmidt:

The August issue of Physics Today has arrived and in this note I want to tell you that I am pleased with the outcome.

I thank you for the good work that you did on our behalf.

With regards,

C. F. Quate

CFQ:am

RÉPUBLIQUE FRANÇAISE

COMMISSARIAT A L'ÉNERGIE ATOMIQUE

SERVICE DE PHYSIQUE
DU SOLIDE ET DE RÉSONANCE MAGNÉTIQUE
ORME DES MERISIERS - 91191 GIF-SUR-YVETTE CEDEX FRANCE
TÉLEX : ÉNERGAT SACLAY 690641 F

5 March 1986

Dear Gloria,

I was very pleased that my article was accepted for Physics Today without any major revisions. I enjoyed interacting with Jeff Schmidt, and felt that he significantly improved the quality of the manuscript. I look forward to seeing the March issue.

With best wishes,

Yours sincerely,

John Clarke

RECEIVED
MAR 12 1986
PHYSICS TODAY

RÉPUBLIQUE FRANÇAISE

COMMISSARIAT A L'ÉNERGIE ATOMIQUE

SERVICE DE PHYSIQUE
DU SOLIDE ET DE RÉSONANCE MAGNÉTIQUE

ORME DES MERISIERS - 91191 GIF-SUR-YVETTE CEDEX FRANCE

TÉLEX : ÉNERGAT SACLAY 690641 F

4 April 1986

Dear Jeff,

I was delighted to see that you were able to have "eye" moved in Fig. 5 of my article — I really appreciate your taking care of this.

I thought the special issue came out rather nicely. Thanks again for your help with my article.

Yours sincerely,

John Clarke

UNIVERSITY OF CALIFORNIA, SAN DIEGO

BERKELEY • DAVIS • IRVINE • LOS ANGELES • RIVERSIDE • SAN DIEGO • SAN FRANCISCO SANTA BARBARA • SANTA CRUZ

DEPARTMENT OF PHYSICS, B-019
LA JOLLA, CALIFORNIA 92093

April 14, 1986

Ms. Gloria B. Lubkin, Editor
Physics Today
335 East 45 Street
New York, N. Y. 10017

RECEIVED
APR 21 1986
PHYSICS TODAY

Dear Gloria,

It is unfortunate that our paths didn't cross during the March APS meeting in Las Vegas, Hopefully, I will have another opportunity to see you some time in the near future.

I am writing to thank you for inviting me to contribute the article "Novel Types of Superconductivity in f-Electron Systems" for Physics Today. I am very pleased with the way the article turned out, and I enjoyed working with you and Jeff Schmidt on it. I had the opportunity to meet Jeff in Las Vegas, to tell him how much I liked the article, and to thank him for his considerable effort he put into its preparation.

With best regards,

Sincerely,

Brian

M. Brian Maple

MBM:njm

KUNGL. TEKNISKA HÖGSKOLAN
THE ROYAL INSTITUTE OF TECHNOLOGY

Department of Plasma Physics

Stockholm, September 29, 1986

Dr Gloria Lubkin
Physics Today
335 East 45 Street
New York, N.Y. 10017 USA

Dear Dr Lubkin,

I wish to thank you for the very nice presentation which Physics Today has given my paper "Plasma Universe". I believe that your publication will mean a breakthrough for the general understanding of plasma phenomena in astrophpysics and the acceptance of ideas for which I have fought for more than 40 years.

Please convey my appreciation to Dr.Jeffrey D. Schmidt, with whom I have had a number of fruitful telephone conversations.

Yours sincerly,
Hannes Alfvén

Hannes Alfvén

RECEIVED
OCT 0 1986
PHYSICS TODAY

Postal address: The Royal Institute of Technology
Street address: Teknikringen 33
Telephone: 08 - 787 70 00
Cable address: Technology
Telex: 102 89 Kthb STOCKHOLM

KUNGL. TEKNISKA HÖGSKOLAN
THE ROYAL INSTITUTE OF TECHNOLOGY

Department of Plasma Physics

Stockholm, September 29, 1986

Dr Gloria Lubkin
Physics Today
335 East 45 Street
New York, N.Y. 10017 USA

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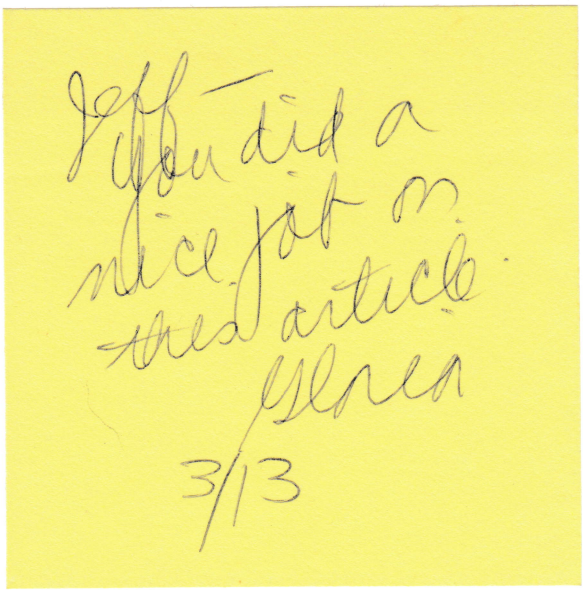
Yours sincerly,
Hannes Alfvén

Nobel → Hannes Alfvén
laureate

RECEIVED
OCT 0 1986
PHYSICS TODAY

Postal address: The Royal Institute of Technology
Street address: Teknikringen 33
Telephone: 08 - 787 70 00
Cable address: Technology
Telex: 103 89 Kthb STOCKHOLM

Physics Today, April 1987, page 56




**FILE: NAGLE 377 QUEUE:TYP-OUT**
**IS: PT- FMT:**
**BY: J ;25/02,12:10 REV: ELLS ;12/03,08:41**
**12-MAR-87 09:24:14**

11 March 1987, 3:30 pm.

**This article has three tables.**

Dr. Darragh Nagle and Dr. Mikkel Johnson
Los Alamos National Laboratory
Mail stop H864
Los Alamos, New Mexico 87545
505-667-2971 (Nagle)
505-667-6942 (Johnson)

Dr. David Measday
Physics Department
University of British Columbia
6224 Agriculture Road
Vancouver, BC
Canada V6T 2A6
604-228-5098 (Measday)
604-228-3853 (physics department)

Physics Today, April 1987, page 56

**FILE: NAGLE 377 QUEUE:TYP-OUT**
**IS: PT- FMT:**
**BY: J ;25/02,12:10 REV: ELLS ;12/03,08:41**
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Dr. Darragh Nagle and Dr. Mikkel Johnson
Los Alamos National Laboratory
Mail stop H864
Los Alamos, New Mexico 87545
505-667-2971 (Nagle)
505-667-6942 (Johnson)

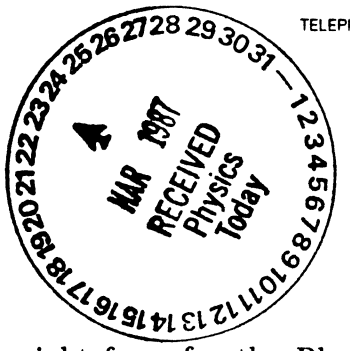
Dr. David Measday
Physics Department
University of British Columbia
6224 Agriculture Road
Vancouver, BC
Canada V6T 2A6
604-228-5098 (Measday)
604-228-3853 (physics department)

Jeff You did a nice job on this article. Glenn 3/13

↑ Note from the editor of Physics Today (Schmidt's supervisor)

Los Alamos
Los Alamos National Laboratory
Los Alamos,New Mexico 87545

DATE: March 20, 1987
IN REPLY REFER TO: MP-DO
MAIL STOP: H830
TELEPHONE: (505) 667-2971




Ms. Gloria B. Lubkin/Editor
Physics Today
335 East 45 Street
New York, NY 10017

Dear Gloria:

We are returning the copyright form for the Physics Today article. David Measday would be pleased to sign if that is required.

May I say Jeff Smiths' efforts produced what the authors consider to be a much more readable article, for which we are most appreciative.

Sincerely,

Darragh Nagle
Senior Fellow

DN:rs

enc.: a/s

cy: CRM-4(2), MS A150
File

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of THE CITY UNIVERSITY OF NEW YORK

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DEPARTMENT OF PHYSICS

TELEPHONE: 718-520-5000

March 31, 1987

Dr. Jeffrey Schmidt
PHYSICS TODAY
335 E. 45th Street
New York, NY 10017

Dear Jeff:

I want to thank you for your extraordinary efforts in ferreting out eye-grabbing photos of vehicle accidents. In fact, they captured my attention to the extent that I read the article yet again.

I think every aspect, the photos, layout, color, length, etc., have made a balanced and easily readable article. You have done a fine job of editing and I and my colleagues appreciate it.

Sincerely,

Art

Arthur C. Damask
Professor

ACD:sa

UNIVERSITY OF OREGON

Russell J. Donnelly
Professor of Physics
(503) 686-4226

RECEIVED
MAY 1987
Physics Today

May 5, 1987

Dr. Gloria Lubkin, Editor
Physics Today
140 East 45th Street
37th Floor
New York, NY 10017

Dear Gloria:

Now that my parts of the February and April Physics Today are published I want to thank you very much for making it all possible.

First of all, I thank you on behalf of the low temperature community for the nice series of articles on $^3$He and $^4$He. It was nice to think of being part of the good old low temperature community. Who the heck would have thought that by April superconductivity would be headed for temperatures created by ice and salt? I wonder what our friends will call themselves now?

I was also pleased by all the telephone calls on the Dana article. Not the least surprise was to find that Leo Dana is the person who got Dave Lazarus interested in science.

I would especially like to thank Jeff Schmidt, who worked closely and thoughtfully with me to make it all become real.

Yours sincerely,

Russell

Russell J. Donnelly

RJD:mcr
0401C

JS from OL

Lawrence Berkeley Laboratory
1 Cyclotron Road Berkeley, California 94720
(415) 486-4000 • FTS 451-4000

May 8, 1987


Dr. Daniel E. Koshland, Jr., Editor
SCIENCE
1333 H Street, N.W.
Washington, D.C. 20005

Dear Dan:

Many thanks for your letter, of 29 April, telling of your decision to publish my article, if I revised it to conform to your standards of length, etc. Your letter arrived on my desk in the same mail as one from Physics Today, enclosing a revised manuscript for my talk, as edited by Jeff Schmidt. This may sound as though I was dealing, improperly, with two journals, at the same time, but the following history should clear me of such charges. Last Fall, Gloria Lubkin, editor of Physics Today, called to ask me if I would write an article for her magazine. I said I had just been invited to give a lecture at the Royal Swedish Academy, during the 1986 Nobel Festival. She said she'd like to have an opportunity to publish the text of that talk.

When I had finished the manuscript, in late January of this year, I sent a copy to Gloria, who called to say that it was twice as long as she could publish. I suggested that she print it serially, in two issues but she said that wasn't a viable option. I certainly didn't suggest that I edit it down to half its length -- it had taken me two months to get it down to what I considered to be my bare minimum, of about 10,000 words.

I thought I had been firmly rejected, and have no memory of what Gloria is sure she told me -- that if her editors could cut it in half, then she'd like to publish it. So at the suggestion of Bill Glen, who is writing the history of the impact hypothesis, and who had recently been installed as historical editor by EOS, I submitted it to EOS. Bill Glen did his best to persuade his editor to accept my Stockholm manuscript, but with no success.

You know most of the story since then; I believe that I had already sent you a copy -- not as a potential publisher but as a friend, and we talked about the difficulties I was having in getting it published, in spite of my pride of authorship. I don't remember all the details of our conversation, but I believe that when I asked if you'd consider publishing it, you suggested that I formally submit it to Science. I was really surprised when your reviewer said it shouldn't be published, and I then (as you know) spoke of my problem and my frustration, to my two friends with connections to the editing of your magazine, Phil Abelson and Dave Raup. They sounded friendly, but they apparently came on too strongly for your taste. But your letter of 29 April indicates that they may have had the effect I had hoped for, because you say, "Science is planning to publish a revised copy," if I would revise it to conform to Science standards.

But as I said in my opening paragraph, the edited-down copy of my talk arrived from Physics Today in the same mail as did your recent letter. I was of course very surprised to see that Physics Today had spent so much editorial effort on my manuscript, after what I had thought was a firm rejection, and a friendly "breaking-off of negotiations" between me and Gloria. I've discussed the matter at length with Gloria, and said at first that Science was certainly the better vehicle for publication, since it reached a wider scientific audience. She countered by saying that these days, all members of the AGU get copies of Physics Today, and the impact-related cover picture would catch the eyes of the earth scientists.

But probably, the most telling point was that if I went with Science, I would have let Gloria waste three weeks of Jeff Schmidt's time, and I'd have to waste a similar amount of my time, to do my own editing. And I had to take seriously Gloria's confidence that we had made a deal to let her publish my edited-down version, even though my normally excellent memory had no record of it. (In the world of business, a mix-up like this would keep a few lawyers busy for a month or two. So isn't it nice that we don't let lawyers play in our sandbox?)

I really appreciate your willingness to give me a second chance, Dan, but in view of all the points I've set down in this letter, I think I should go with Physics Today.

Very sincerely,

Luis W. Alvarez

LWA/jrb
enclosure
c: Gloria B. Lubkin

P.S. I look forward to seeing the report by Bruce Bohor et al. of the USGS, in Denver, that you published today. Tom Brokaw had the story on his NBC Nightly News, last night, and the Chronicle had more details, this morning. With Walter's permission, I'm enclosing a copy of a reply to NATURE, evaluating the latest efforts by Officer and Drake, to shed doubt on our work. Walt thinks it will be signed by the roughly eight members of his group that has had a communication accepted by NATURE, backing the idea of "step-wise mass extinction," caused by comet showers. As I said in my Stockholm talk, this group comprises one astronomer, two geologists and five or six paleontologists. You will recognize that I couldn't have written such an article, but after spending several years in the company of paleontologists, I am confident that what Walt and his friends say is really true. I'm convinced that Officer and Drake and their few supporters will be simply an embarrassing footnote to the history of the K-T extinction-by-impact hypothesis, when that history is completed by Bill Glen, who has hundreds of hours of audio-taped interviews with "all the players."

P.S. [illegible] L.W.A.

7891

# AMERICAN INSTITUTE OF PHYSICS

335 EAST 45 STREET, NEW YORK, NEW YORK 10017 • Telephone (212) 661-9404
Telex 960983 AMINSTPHYS-NYK

KENNETH W. FORD
*Executive Director and CEO*


28 October 1987

To: Gloria Lubkin

From: Kenneth W. Ford KF

Subject: Canavan - Bloembergen-Patel debate

Congratulations to you and your staff on a superb job of presenting the Canavan vs. Bloembergen and Patel material. It is very effective and much more readable than standard "debate" formats. The PT lead-ins help too. I am very impressed by the job you have done.

KWF:lab

cc: John Rigden


OCT 1987
RECEIVED
Physics
Today

# AMERICAN INSTITUTE OF PHYSICS

335 EAST 45 STREET, NEW YORK, NEW YORK 10017 • Telephone (212) 661-9404
Telex 960983 AMINSTPHYS-NYK

KENNETH W. FORD
*Executive Director and CEO*


28 October 1987

To: Gloria Lubkin

From: Kenneth W. Ford Ke ← AIP executive director and CEO

Subject: Canavan - Bloembergen-Patel debate

Edited by Schmidt

Congratulations to you and your staff on a superb job of presenting the Canavan vs. Bloembergen and Patel material. It is very effective and much more readable than standard "debate" formats. The PT lead-ins help too. I am very impressed by the job you have done.

KWF:lab

cc: John Rigden


OCT 1987
RECEIVED
Physics
Today

UNIVERSITY OF TOKYO
7-3-1 HONGO, BUNKYO-KU, TOKYO 113, JAPAN

FACULTY OF SCIENCE
DEPARTMENT OF PHYSICS

TELEPHONE: 03-812-2111
CABLE: TOKUNIV RIGAKU
TELEX: UTPHYSIC J23472

RECEIVED
NOV 1987
Physics Today

13 November 1987

Dr. Gloria B. Lubkin
Editor, Physics Today
American Institute of Physics
335 East 45th Street
New York, NY 10017
U.S.A.

Dear Dr. Lubkin,

Thank you very much for your letter of November 6.

It was a great pleasure to meet you and to talk with you in Washington.

I received the edited version of my manuscript. I was very happy to see the beautifully edited version of my article.

I am now herewith sending you back a copyright form which you requested to fill out.

Many thanks again for inviting me to write an article in Physics Today. I hope to see you again in the near future.

Yours sincerely,

Hiroshi Kamimura

MOORHEAD
STATE UNIVERSITY

A Century of Excellence / 1887-1987

March 10, 1988

Ms. Gloria B. Lubkin, Editor
Physics Today
335 East 45th Street
New York, New York 10017

Dear Ms. Lubkin:

I acknowledge with thanks the receipt of your letter of March 7, 1988, informing me about the acceptance of my manuscript for publication in Physics Today (April issue). I am herewith enclosing the copyright form duly signed.

I take this opportunity to thank you and your associates, especially Jeff Schmidt, for bringing this project to a successful ending. It has been a very rewarding experience for me and I have very much enjoyed working with Jeff Schmidt.

Sincerely,

Vijendra K. Agarwal
Associate Professor
Department of Physics and Astronomy

VJK/lt
enclosure

RECEIVED
MAR 1988
AMERICAN INSTITUTE OF PHYSICS

AMINSTPHYS NYK
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AMINSTPHYS NYK

DR JEFRF SCHMIDT
ASSOCIATE EDITOR, PHYSICS TODAY
AMERICAN INSTITUTE OF PHYSICS
335 EAST 45TH STREET
NEW YORK, NY 10017
USA

DEAR DR SCHMIDT,
RECEIVING PHYSICS TODAY DECEMBER SPECIAL ISSUE 'PHYSICS IN JAPAN', I WAS VERY PLEASED AND HAPPY TO SEE THAT MY ARTICLE WAS PUBLISHED SATISFACTORILY. THIS IS ENTIRELY DUE TO YOUR GREAT HELP. I WOULD LIKE TO THANK YOU FOR YOUR KIND COOPERATION.
IS IT POSSIBLE TO OBTAIN REPRINTS OF MY ARTICLE? SINCE THERE ARE A NUMBER OF REQUEST FOR REPRINT FROM ALL OVER THE WORLD, I WOULD LIKE TO HAVE 100 OR 200 REPRINTS, DEPENDING ON ITS COSTS. WOULD YOU KINDLY LET ME KNOW IT BY TELEX (UTPHYSIC J-23472) OR BY FAX (3-814-9717). BEST REGARDS,
HIROSHI KAMIMURA

Ŧ
AMINSTPHYS NYK

TO REPLY FROM TELEX I OR II (TWX) DIAL 100. FROM EASYLINK USE /WUW.
EST 0206 APR/06/1988

**Giorgio Margaritondo**

Bitnet:
Giorgio@Wiscpsl

**Synchrotron Radiation Center**
**University of Wisconsin-Madison**
3731 Schneider Drive
Stoughton, WI 53589-3097 – Phone (608) 873-6651

1988 April 21

Dr. Gloria Lubkin
Editor, Physics Today
335 East 45th Street
New York, NY 10017

RE: **My article in Physics Today (April 1988)**

Dear Gloria:

Now that my article has been published, I would like to thank you for giving me this opportunity to celebrate the 100th anniversary of Hertz's discovery. As usual, your staff has done an outstanding job in transforming my English-Italian into an impeccable text that Hemingway would not have minded to sign — and my poor pictures into super-sharp figures.

Would you please extend my thanks to the staff that was involved in the production of the article.

With my best regards.

Sincerely,

Giorgio Margaritondo
Associate Director for Research

GM:tlm

To Jeff Schmidt
With appreciation for considerable editorial help.
Jerome Karle

# MACROMOLECULAR STRUCTURE FROM ANOMALOUS DISPERSION

Jerome Karle

Reprinted from PHYSICS TODAY, June 1989 © American Institute of Physics

To Jeff Schmidt
With appreciation for considerable editorial help.
Jerome Karle

# MACROMOLECULAR STRUCTURE FROM ANOMALOUS DISPERSION

Jerome Karle ← Nobel laureate

Reprinted from PHYSICS TODAY, June 1989 © American Institute of Physics

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

DEPARTMENT OF PHYSICS

77 MASSACHUSETTS AVENUE
CAMBRIDGE, MASSACHUSETTS 02139

Robert J. Birgeneau
Head of the Department of Physics
Cecil and Ida Green Professor
Of Physics

Room 6-113
(617) 253-4801
Telefax
(617) 253-8554

July 19, 1989

Dr. Gloria B. Lubkin
Editor, Physics Today
335 East 45 St.
New York, NY 10017

Dear Gloria,

As you realize, our Liquid Crystal article finally appeared in Physics Today and it looks beautiful! I feel obligated to confess to you that you were quite correct in insisting that we simplify the original manuscript. Joel Brock and I have already gotten many compliments on the article - compliments we undoubtedly would not have received for the original version which was too technical. You should also congratulate Jeff Schmidt on a fine editing job. He was a pleasure to work with and he made a number of excellent stylistic improvements.

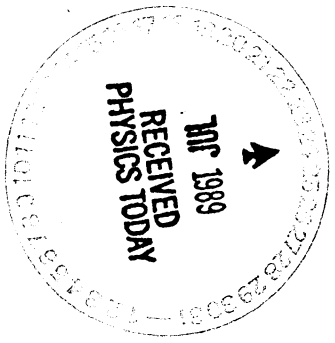
Best regards!

Yours sincerely,

Robert J. Birgeneau

Robert J. Birgeneau

RJB/km



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GLORIA B LUBKIN
EDITOR
PHYICS TODAY
335 EAST 45TH STREET
NEW YORK N Y 10017
U S A

DEAR GLORIA,
THANK YOU FOR PROVIDING FREE OFFPRINTS. I HAVE ALREADY RECEIVED ABOUT TWENTY RESPONCES ON ENERGY AND MASS. MOST OF THEM ARE FAVORABLE, ONE CRITICAL AND SEVERAL CRAZY. HOW MANY LETTERS HAVE YOU RECEIVED IN CONNECTION WITH MY ARTICLE?

THE OFFPRINT LOOKS QUITE IMPRESSIVE, AND I'M GRATEFUL TO JOFFREY SCHMIDT FOR THIS. I HAVE ALSO RECEIVED A LETTER FROM PETER G.BROWN SAYING ''WE ARE PLEASED TO ENCLOSE A COMPLIMENTARY COPY OF OUR JUNE ISSUE''. BUT THE COPY ITSELF DID NOT ARRIVE.

I HAVE THE MOST WARM RECOLLECTIONS FROM MY VISIT TO YOUR OFFICE.

WITH CORDIAL WISHES,
LEV OKUN

*
AMINSTPHYS NYK

411059 CERII SU

Helsinki University of Technology
Low Temperature Laboratory
Dr. Olli V. Lounasmaa, Director,
Research Professor of the Academy
of Finland

Helsinki, Oct. 12, 1989

Ms. Gloria Lubkin
Physics Today

Dear Gloria:

I was very pleased with the typographical appearance of my article in the October issue of Physics Today. Please convey my appreciation to Jeff Schmidt as well.

Best wishes,
Sincerely yours,

Olli V. Lounasmaa

OCT 1989
RECEIVED
PHYSICS TODAY

KØBENHAVNS UNIVERSITET
**NIELS BOHR INSTITUTET**

Blegdamsvej 17, DK-2100 København Ø
Telefon: 01 42 16 16
Telegram: PHYSICUM, København
Telex: 15216 nbi dk

tCl Jan 15

December 14 '89

Dear Gloria

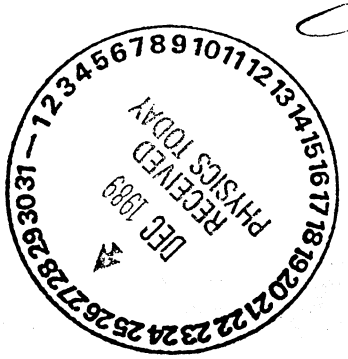
I have just received a copy of the December issue of Physics Today. I want you to know how very pleased I am with the way my piece has come out. Please tell that also to all those others who worked on it.

I am just back from hectic but very pleasant days in Stockholm where Ida and I attended the Nobel circus.

Season's greetings

Yours

Boas



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From Abraham Pais, Einstein's biographer

to Gloria 15

December 14 '89

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Article edited by Schmidt →

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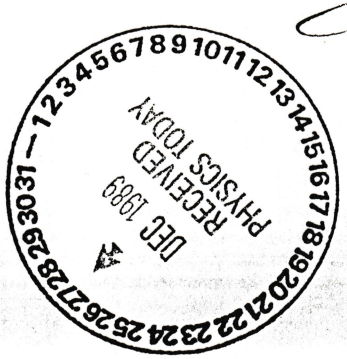


# CALIFORNIA INSTITUTE OF TECHNOLOGY

Arthur Amos Noyes Laboratory of Chemical Physics, Mail Code 127-72
Pasadena, California 91125

AHMED H. ZEWAIL

LINUS PAULING PROFESSOR
OF CHEMICAL PHYSICS

Telephone: (818) 356-6536
Telex: 675425 CALTECH PSD
FAX: 818-792-8456



MAY 1990
RECEIVED
PHYSICS TODAY


May 9, 1990

Dr. Gloria Lubkin
Editor
Physics Today
140 E. 45th Street (37th Floor)
New York, New York 10017

Dear Dr. Lubkin:

This letter is regarding the Physics Today special issue on Dynamics of Molecular Systems. As you know, I was one of the authors of the special issue, and I interacted with Jeff Schmidt in the process of producing our article. I wanted you to know that Jeff has made very important suggestions, and I really do appreciate his genuine interest in producing high quality articles. He is excellent and Physics Today is lucky to have him.

I was delighted to write the article, and I hope that this special issue will be of interest to your readers.

Sincerely yours,

Ahmed H. Zewail

AHZ:lm

**Department of Nuclear Engineering and Engineering Physics**

**University of Wisconsin**

153 Engineering Research Building
1500 Johnson Drive
Madison, WI 53706-1687
Phone (608) 263-1646

January 3, 1992

Professor James D. Callen
521 Engineering Research Building
1500 Johnson Drive
Madison, WI 53706-1687
Phone (608) 262-1370
FAX (608) 262-6707
CALLEN@UWM

Gloria B. Lubkin, Editor
Physics Today
335 East 45th Street, 37th floor
New York, NY 10017

Dear Gloria:

As you are undoubtedly aware by now, we have finally completed the two articles on "Progress Toward a Tokamak Fusion Reactor" and "Stability and Transport Processes in Tokamak Plasmas," which will be published in your January issue. I apologize for its taking so long for us to complete them -- it took me being on sabbatical this year to have enough time to finally get them completed, even with Rob Goldston ultimately assuming the lead role on the first article. I appreciate your forbearance with our delayed schedule. We are especially pleased that both articles are being published in a single issue with a picture of TFTR on the cover since we now realize how unlikely that situation is under normal circumstances. Finally, I would like to note how helpful your technical editors, Jeff Schmidt and Graham Collins, have been in polishing up these articles and making them much more understandable to the physics community beyond plasma physics. In particular, I learned a lot about simplicity and precision in technical writing from Jeff Schmidt's careful, patient technical editing of my manuscript and my numerous clarifying discussions with him. This experience should be quite helpful to me in my present project -- writing a graduate level textbook on plasma physics.

With regard to the free copies of the January issue and offprints which, according to your letter of 22 November, you will be providing for each article, could you please send all of them (total of 6 magazine copies plus 100 + 100 offprints) to me at my University of Wisconsin address. I will take care of distributing them equitably to the six coauthors of the two articles in this cooperative venture. For your reference, we are also ordering through the AIP 600 copies of a special offprint package comprised of the cover and the two articles.

As this saga draws to a close, I wish you the best of luck in dealing with authors and acquiring manuscripts from them in a timely manner -- to get them into a magazine that has to be balanced and timely, but in any case must go out monthly. It must be a nerve-wracking job. Best wishes for continued success at it.

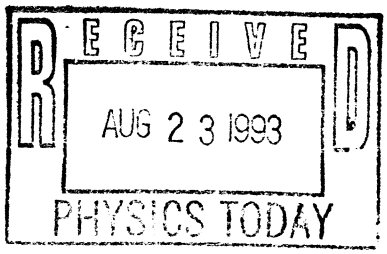
Sincerely,

James D Callen

James D. Callen
Kerst Professor of Nuclear Engineering
& Engineering Physics and Physics

JDC:blg
cc: J. Schmidt

Department of History
**West Virginia University**
College of Arts and Sciences




20 August 1993

Dr. Gloria B. Lubkin
Editor
Physics Today
335 East 45th Street
New York, NY 10017

Dear Dr. Lubkin:

Thanks for yours of 4 August inviting Rick Slavings and myself to contribute a paper on "The Industrialization of American Astronomy, 1890-1940." We accept with great pleasure.

There is, however, one problem. My wife has been offered a deanship at University of Nebraska-Lincoln and the powers that be are working on a professorship for me. This process is still in an early stage, but may consume a fair amount of my attention and energy this fall. If the matter has a happy ending (and Nebraska would be a good venue for both of us), the new jobs will begin 1 January 1994. This entails moving. Of course, with the prospect of moving to College Park facing you and the PT staff, I need hardly say that even in the best of organizations, there will be some disruption and slippage. Thus I am not able to give you an exact date for delivery of a manuscript. I will do so just as soon as things become clear on this end. Late winter 1994 will be my goal. Earlier if possible.



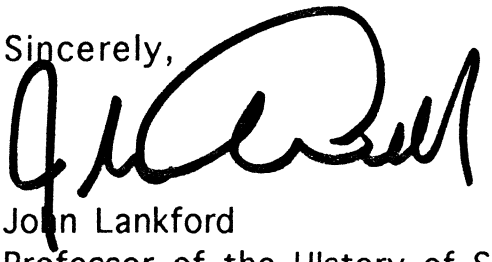
304 293-2421 □ 202 Woodburn Hall □ Morgantown, WV 26506
Equal Opportunity / Affirmative Action Institution

Lankford to Lubkin, 20 August 1993

I have been reading on the topic of Big Science and want to recast the paper as follows. The new title would be something like: **THE MAKING OF BIG SCIENCE: THE INDUSTRIALIZATION OF AMERICAN ASTRONOMY, 1880-1940.** And we would begin with a paragraph placing the problem in the context of the history of big science. This will be done with appropriate references to physics as the exemplar of Big Science. The literature suggests that a major problem is understanding the pre-1940 roots of Big Science in America and this paper will be aimed at that problem. If all goes well, I will us this problem as the topic for my seminar at Nebraska when I go to interview. A little pre-testing feed back is always useful.

I hope that Jeff Schmidt will be assigned to work with me once you have the manuscript. He is first-rate and we worked very well together on the 1990 paper.

Sincerely,



John Lankford
Professor of the HIstory of Science

From lagally@neep.engr.wisc.edu Sat Jan 8 22:24:30 1994
From: lagally@neep.engr.wisc.edu
Subject: APS meeting
To: jds@aip.org
Date: Sat, 8 Jan 94 21:24:26 CST
Cc: lagally@neep.engr.wisc.edu (Max G. Lagally)

Jeff: I don't know whom to ask, so I ask you becasue you told me last year. I have an invited lecture to give at APS in March (Adler Lecture) and because I have a tight schedule and am trying to get make arrangements, I would like to know what day my talk is. Can you find out for me please? Thanks.

I have had numerous compliments on the article,even comments from class mates I haven't seen for many years.

Max

--
Max G. Lagally
E. W. Mueller Professor
University of Wisconsin--Madison
(608) 263-2078
lagally@engr.wisc.edu

KØBENHAVNS UNIVERSITET

**NIELS BOHR INSTITUTET**

Blegdamsvej 17, DK-2100 København Ø
PHONE: (+45) 3532 5200
PHONE, direct (+45) 353 25
TELEFAX, national: (31) 42 10 16
TELEFAX, internat: +45 31 42 10 16

# TELEFAX

to: Mr. Jeff Schmidt

page 1 of: 2.

Telefax no.: 001-301-2090842

date: 6/21/94

Ref.:

Dear Mr. Schmidt. Attached please find corrections to my piece for Ph. Today. I compliment you on your editing — and on your excellent choice of pictures! Perhaps it is too early to ask:

(1) How many free offprints

(2) How many can I order? Price?

I'd like them all in the cover.

Please contact if there are further questions.

Best regards as to Gloria

Bram Pais

From Abraham Pais, Einstein's biographer

KØBENHAVNS UNIVERSITET

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Blegdamsvej 17, DK-2100 København Ø
PHONE: (+45) 3532 5200
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Bram Pais

PHYSICS TODAY
from Jeff Schmidt

Blegdamsvej 17, DK-2100 København Ø
PHONE: (+45) 3532 5200
PHONE, direct (+45) 353 25
TELEFAX, national: (31) 42 10 16
TELEFAX, internat: +45 31 42 10 16

18 July 94

Gloria —

I don't know if you saw this. It's a note from Abraham Pais complimenting us on our editing of his article.

Jeff

**LEFAX**

Jeff Schmidt
#2.
301-2090842
6/21/94

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I'd like them all with covers.
Please contact if there are further
questions. Best regards as to
Gloria
Bram Pais

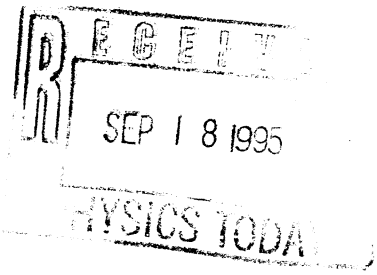
University of Illinois
at Urbana-Champaign

**Department of Physics**

Loomis Laboratory of Physics
1110 W. Green Street
Urbana, Illinois 61801

James P. Wolfe

Telephone: (217) 333-2374
Telefax: (217) 244-2278
E-Mail: j-wolfe@uiuc.edu




September 8, 1995

Stephen Benka, Editor
Physics Today
One Physics Ellipse
College Park MD 20740-3843

Dear Steve,

Many thanks to you and your staff for the excellent job you did with my article in the September 1995 issue of Physics Today. The graphics reproduced beautifully, and, of course, the cover is stunning. My interactions with Jeff Schmidt were very pleasant and constructive. The article benefitted greatly from your reviewers' suggestions; it is much better than the one I originally sent you.

The alliteration on the cover, "Seeing Sound in Solids," adds a nice touch. Thanks for inventing it. I will look forward to working with you again in the future.

Sincerely,

Jim Wolfe
Professor of Physics

University of Illinois
at Urbana-Champaign

**Department of Physics**

Loomis Laboratory of Physics
1110 W. Green Street
Urbana, Illinois 61801

James P. Wolfe

Telephone: (217) 333-2374
Telefax: (217) 244-2278
E-Mail: j-wolfe@uiuc.edu

October 20, 1995

Jeff Schmidt
Physics Today
One Physics Ellipse
College Park MD 20740-3843

Dear Jeff,

Thanks for returning the graphics materials. It was a real pleasure working with you on the article. You and your staff did a terriffic job.

I recently received a phone call from one of the organizers of the Acoustical Society Meeting (November, St. Louis) with a request to submit some of the "stunning" photos in Physics Today to their first Gallery of Acoustics. It is exciting to publish an article which has appeal to experts as well as (hopefully) the general reader.

I will look forward to working with you in the future.

Sincerely,

Jim Wolfe
Professor of Physics

# FAX COVER SHEET

**To:** Dr. Steve Benka

**From:** Daniel Kleppner
M.I.T., room 26-237
Cambridge, MA. 02139
phone: (617) 253-6811
FAX : (617) 253-4876
internet: DK@kleppner.mit.edu

**Date** Wed Nov 22 13:31:33 EST 1995

**Pages (including cover):** 3

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To everyone:

Here is another in an occassional series of comments from our Advisory Committee. Recall, that I was asked by them to nag them monthly, and I do. I don't generally circulate those comments I've received that are not constructive.

— Steve

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DEPARTMENT OF PHYSICS

DANIEL KLEPPNER
Lester Wolfe Professor of Physics

address: MIT
room 26-237
Cambridge, MA 02139

phone: 617/253-6811
fax: 617/253-4876
dk@amo.mit.edu

November 22, 1995

Dr. Stephen G. Benka
American Institute of Physics

Dear Steve,

I am sorry to be tardy in giving you feedback on PT, but let me start to catch up by commenting on the October issue. I will not comment on every item on your list, only on topics for which I have something to say.

General: the issue strikes me overall as strong. The cover is spectacular (though the title "sounding out the sun" is a trifle cutesy- particularly since one looks rather than listens), and the balance of articles is excellent- encompassing physics, geophysics, and biography.

PHYSICS UPDATE: interesting topics. However, the opening line "A silicon device for triggering a nerve cell has been constructed...." is pretty dull, as is invariably the case with the passive. The other reports have a zippier style. The AC suggested better graphical design for the page. One thought- develop a set of small logos- say for quantum mechanics, medical physics, materials, etc.- that would give a quick identification of the area while also adding visual interest. These could be small and placed in the margin. You might run a design contest to get suggestions from the readers. That could be done electronically. You would have to think carefully whether it is worth the effort, but it might drum up reader interest.

REFERENCE FRAME. Preachy.

LETTERS: The letter of Seaborg et al demolishes Gabbard's hypothesis, which raises the question of how Gabbard's letter got published in the first place. I haven't gone back to read it, but even Gabbard now disowns it. A more rigorous scientific review of his letter would have saved confusion. More seriously with respect to this column, the letters of Hayden, Ravnik and Cohen take up lots of space and do not add anything new. Your readers should not be led, as I was, to read a long correspondence and then find that most of it is simply overkill. In my opinion, PT should have published the Seaborg letter, a brief note to say that Hayden, Ravnik and Cohen had come to similar conclusions, and Gabbard's reply.

Ershkovich's letter on Sagdeev reinforces my view that Alpert's attack on Sagdeev was irresponsible and that PT was irresponsible in publishing it.

ARTICLE- QUANTUM INFORMATION..: This is a fascinating topic and Bennett writes with great authority. However, I must confess that I found it too difficult to follow. Perhaps that is the nature of the beast. However, the graphics are attractive and that always makes one feel friendlier.

ARTICLE- HELIOSEISMOLOGY. Once again, the topic is fascinating. In this case I thought that I could understand it, but the text did not grip me. Too often it turned into a catalog of facts. ("Three ground-based networks of imaging helioseismological instruments are in various stages of development.")

ARTICLE- SCHWINGER. I saw this paper in the manuscript stage and thought that it was very disappointing. However, in PT it is absolutely first rate. The pictures, particularly Rabi, Schwinger and Weisskopf, add a great deal, the title was improved, and I suspect there was some editing. In any case, I enjoyed this immensely.

CAREER CHOICES. This is an excellent article, interesting in its own right and perfect for its goal of letting young physicists know the range or possibilities open to them.

BOOKS: The BEC volume is most timely, and makes a good headline for the section. The report of the Internet book points out that the book will be out of when the reader sees the review. Although the topic is pedestrian, the report provides a useful service. The new Feynman biography sounds pretty good but I question the need for yet another book. The review is relatively long. I would have opted for a briefer report. The book "Electric and Magnetic Interactions" is an undergraduate text. PT cannot hope to keep up with this category and should, in my opinion, leave it to AJP, which regularly reviews texts.

WE HEAR THAT: I am glad to hear of what is going on. I know that this column is not everyone's cup of tea, but it is mine.

OBITUARIES: The Ford obituary was extremely interesting to me. I knew Ford professionally but was never clear on what he had really done. He was somewhat of a joker which helped to obscure his accomplishments. The obituary is excellent. The other obituaries were also interesting to me as human documents. It is too bad that these stories must be told in a lugubrious context but I can't think of a suitable alternative.

I hope that these comments are useful. I will try to do the same for the November issue. However, if there are items for which you particularly want feedback, let me know and I will be sure to cover them.

Sincerely,

Dan

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Article edited by Schmidt

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Sincerely,

Dan

Jeff.

Moses Chan says

"Please thank Jeff for me."

"Thanks" from Moses Chan.

— Steve 7/15/96

3/18/97

**PHYSICS TODAY**

from Gloria B. Lubkin 2/3/97

Steve, Jeff,
Paul & Beverly,

Albert Wheelon asks that if we receive letters to the editor about his article that we send him copies.

He's very pleased with the way his article turned out.

3 Feb. 97 Former editor of Physics Today

**PHYSICS TODAY**

from Gloria B. Lubkin

2/3/97

Steve, Jeff,
Paul & Beverly,

Albert Wheelon asks that if we receive letters to the editor about his article that we send him copies.

He's very pleased with the way his article turned out.

**From:** Stephen Benka
**To:** JSCHMIDT, bgl
**Date:** 14 Feb 1997 (Fri) 17:24
**Subject:** Thought you'd like to know

Jeff, Barbara,

I just got a visit from my PhD advisor, who had a major complaint about about December issue. The Sikivie and Amato articles were "too damn good" and he spent far too much time with the magazine.

I thought you'd like to know. Kudos to you both.

--Steve

**From:** Stephen Benka ← Editor of Physics Today (Schmidt's supervisor)
**To:** JSCHMIDT, bgl
**Date:** 14 Feb 1997 (Fri) 17:24
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--Steve

Edited by Schmidt

**From:** "George Crabtree" <george_crabtree@qmgate.anl.gov>
**To:** "Judy Barker" <jbarker@aip.acp.org>
**Date:** 15 Apr 1997 (Tue) 19:24
**Subject:** Vortex Article

Subject: Time: 5:26 PM
Vortex Article Date: 4/15/97

Dear Steve, Jeff, Barbara, and Judy,
I just received the offprints for our article on Vortex Physics in the April issue of Physics Today. What fast service! The article looked very good in the magazine, and I got a warm feeling on finally seeing it in print. Thanks to all of you for your efficient and competant efforts to bring the article out. For David and me, it is gratifying to see the fruits of our work appear with such high production standards. Thank you all once again.
Sincerely,
George Crabtree

George Crabtree - MSD/223
Argonne National Laboratory
9700 S. Cass Avenue
Argonne, IL 60439
phone: 630-252-5509
fax: 630-252-7777
e-mail: crabtree@anl.gov

**CC:** "David Nelson" <nelson@cmt.harvard.edu>

**From:** "Martin L. Perl" <martin@SLAC.Stanford.EDU>
**To:** Jeff Schmidt <jds@aip.org>
**Date:** 2 Sep 1997 (Tue) 17:13
**Subject:** Leptons After 100 Years Article

Dear Jeff

Thank you for changing my ugly duckling of a manuscript into a beautiful swan. You have done a wonderful job.

I have the following comments:

Page 35, column 2: the ***** in "See box 1 on page *****" 36 has not been inserted yet.

Page 39, column 2: the ***** in "See box 2 on page *****" 40 has not been inserted yet.

Page 36, bottom equation in column 2: space required between virtual and Z0.

Page 38, Figure 4: TAU DETECTION scheme might be changed to TAU DETECTION apparatus.

Page 40, Box 2, column i: yes, each h should be an h-bar.

Page 40, References: the names in Ref. 3 are spelled correctly; in Ref. 10 the page number is 2074; in Ref 16 the page number is indeed 79c, it is a conference proceedings and every page has a c added to the page number.

Thank you so much Jeff for all your helpa dn guidance. I am greatly looking forward to the issue.

Sincerely yours

Martin Perl

Nobel laureate

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**From:** "Martin L. Perl" <martin@SLAC.Stanford.EDU>
**To:** Jeff Schmidt <jds@aip.org>
**Date:** 7 Oct 1997 (Tue) 20:33
**Subject:** (no subject)

Dear Jeff:

The October Physics Today came today. You and your staff have made my manuscript into a wonderful and beautiful article. The color is great. Thank you very much. Indeed the entire issue is great.

Thanks again and please express my appreciation to Gloria.

Martin Perl

From: "Ross, Ian (Ian)** CTR **" <iross@lucent.com>
To: "'Jeff Schmidt'" <jschmidt@aip.acp.org>
Date: 11 Oct 1997 (Sat) 5:10
Subject: RE: Closure

Jeff,

Thanks for all your effort. It was a pleasure to work with you.

Ian

COPIES GIVEN TO
HARRIS & BENKA
15 OCT. 97.

**From:** Stephen Benka
**To:** CHARRIS, BRODSKY, horst
**Date:** 13 Oct 1997 (Mon) 11:44
**Subject:** Some strong praise

Charles, Marc, Horst,

Here's some strong praise for Graham and Jeff:

**From:** <LANDAUE@watson.ibm.com>
**To:** ACP.AIP(gcollins)
**Date:** 10/8/97 1:44pm
**Subject:** Your discussion of Grover's algorithm in the latest issue.

Dear Graham,

First of all, a splendid exposition. Am I too honest if I admit that your box actually helped me? And your item correctly stressed that this is the algorithm that may point the way to how we may really want to use quantum computation. Furthermore you pointed to the perils of decoherence. . .
Regards, Rolf

**From:** Martin L. Perl <martin@SLAC.Stanford.EDU>
**To:** Jeff Schmidt <jds@aip.org>
**Date:** 7 Oct 1997 (Tue) 20:33
**Subject:** (No subject).

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Martin Perl

**CC:** gcollins, jeff, glubkin

**From:** Stephen Benka
**To:** jeff
**Date:** 5 Feb 1998 (Thu) 20:15
**Subject:** Sullivan & Barth

Jeff,

I've gone through both articles, and left them on your chair with my notes.

I think they make a great package for our readers. Thanks for your help getting them done in time.

--Steve

**From:** Stephen Benka ← Editor of Physics Today (Schmidt's supervisor)
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**Subject:** Sullivan & Barth

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--Steve

**From:** Kai-Henrik Barth <barth002@tc.umn.edu>
**To:** Jeff Schmidt <jschmidt@aip.acp.org>
**Date:** 21 Apr 1998 (Tue) 11:05
**Subject:** reprints received

Dear Jeff,

I just came back from Europe and found the reprints of my article waiting for me on my desk in my university office. Thanks again for all your effort and time. I am very happy with the final product.

All the best
Kai
--
**********

Kai-Henrik Barth
Program in History of Science and Technology
435 Walter Library
University of Minnesota
Minneapolis, MN 55455
612-626-8722 612-872-9323 (home)
barth002@tc.umn.edu
http://umn.edu/home/barth002/

**********

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AMERICAN INSTITUTE OF PHYSICS

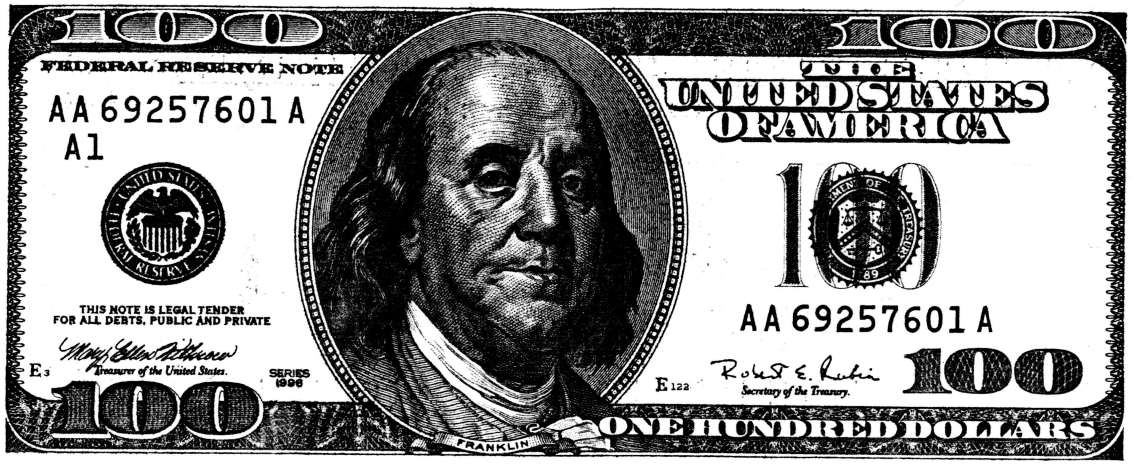
# INTER - OFFICE MEMORANDUM

May 21, 1998

I, Jeffrey Schmidt, hereby acknowledge receipt of a cash "Pat on the Back" award in the amount of $100. I understand that my year-end pay will reflect a "gross up" of this award.

J. Schmidt 23 May 98

Jeffrey Schmidt DATE



We appreciate your outstanding performance.

Steve ceh

We appreciate your outstanding performance.

Steve
Editor of
Physics Today

ceh
Publisher of
Physics Today

FIRST PAGES
2 JUN 98

# TRENDS IN ELECTROMECHANICAL TRANSDUCTION

Nicely done
-SB 6/2/98

**The demand for more sophisticated sensors and actuators in industrial equipment and consumer products is behind today's push for new transducer materials and geometries.**

By Ilene J. Busch-Vishniac

In today's world, it is nearly impossible to avoid contact with electromechanical sensors and actuators over the course of the day, although we rarely recognize them. They drive the keyless entry systems, the light switches that respond to sound or motion, the detectors in cars that determine whether seat belts are fastened and the sound-receiving and sound-generating parts of the telephone, to name just a few examples.

Electromechanical transducers are devices in which one connection to the environment conducts electrical energy and another conducts mechanical energy. Examples include microphones, loudspeakers, accelerometers, strain gauges, resistance thermometers, solenoid valves and electric motors.

There are many ways to categorize transducers. The largest breakdown divides them into sensors and actuators. Transducers used to monitor the state of a system, ideally without affecting that state, are sensors. Transducers that impose a state on a system, ideally without regard to the system load (the energy drained by the system), are actuators. However, this division, although useful, doesn't get to the heart of what makes transducers work.

It is useful to consider transducers from the perspective of energy conversion mechanisms, an approach that also yields two broad classes of devices: those based on geometry and those based on material properties. An example of a geometry-based transducer is a condenser microphone, which is a parallel-plate capacitor with a DC voltage bias between the plates. Sound causes one of the plates to move, thus changing the gap between the plates. This change dynamically alters the capacitance and produces an output voltage. An example of a material property–based transducer is a piezoelectric accelerometer. Piezoelectric materials are those in which there is coupling between the electric field and the mechanical field so that imposed electric fields cause dimensional changes and applied material strains produce voltages. In a piezoelectric accelerometer, acceleration strains the transduction material, giving rise to an electric field that is sensed as a voltage. Of course, these two broad classes may be further refined either in terms of the function of the transducer (for example, sensing fluid flow) or in terms of narrower classes of energy conversion (for example, transduction based on piezoelectricity). The table on page ***** shows the main electromechanical transduction mechanisms. Here the definition of "mechanical" is very liberal, including thermal and optical phenomena.

31

The 1970s and 1980s brought dramatic changes in electronics and signal processing techniques, but only modest changes in electromechanical transducers. As a result, transducers are commonly the least reliable and most expensive elements in measurement and control systems. For this reason, there is a growing emphasis on the field of transduction, and significant changes are beginning to emerge.

## Pervasiveness

In the last few decades, electronics have been incorporated into products of all sorts. Their growth in consumer products has been driven by two phenomena: the public's perception that low-technology (nonelectronic) devices are not as good as high-technology devices, and the push for products with "intelligence."

Low-technology devices whose market is being overtaken by high-technology counterparts range from office equipment such as staplers and pencil sharpeners to kitchen appliances such as juice squeezers. In many cases, we are replacing purely mechanical functions performed under human control by automated electromechanical operations, leading to the introduction of sensors and actuators.

The growing market for intelligent products (those with a decision-making process) comes from the desires to automate some functions that people perform and to add functions that people cannot perform. For instance, although people can control room lights by hand, they often prefer to employ motion or sound detectors and control electronics instead. Examples of intelligent products that extend certain functions beyond standard human performance are smoke detectors, automobile airbags and clothes dryers with autodry cycles.

The growth in transducer markets has been rapid and is predicted to continue on its current pace through the turn of the century. The sensor market alone rose to become a $5 billion a year industry by 1990, with projections for a $13 billion worldwide market by the year 2000—an 8% annual growth rate over the decade.[1]

ILENE BUSCH-VISHNIAC *is Temple Professor of Mechanical Engineering at the University of Texas at Austin and a visiting professor of aerospace and mechanical engineering at Boston University.*



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Note from editor of Physics Today (Schmidt's (supervisor)

FIRST PAGES 2 JUN 98

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**From:** Stephen Benka
**To:** jeff
**Date:** 15 Jul 1998 (Wed) 12:34
**Subject:** A call from Segev

Jeff,

I just spoke with Moti Segev, who is very appreciative of your efforts on his article. He's quite happy with the result.

Well done.

--Steve

**From:** Toni Feder <tfeder@wam.umd.edu>
**To:** stephen benka <sbenka@aip.acp.org>
**Date:** Mon, Oct 5, 1998 7:00 pm
**Subject:** Praise for Jeff & Gloria

Hi Jeff,

I saw Adrian Parsegian last week one evening when he was in Durham. He spoke extremely highly of you, saying how impressed he was with you, how articulate you are, and how much he enjoyed working with you on his article last year.

Just thought I'd pass this on....

Oh, and while I'm at it, as I already told Gloria, in a conversation with MIT's Hale Bradt last week, he said he was generally impressed by PT, and recalled that some years back, he gave Gloria feedback on a "messed up" draft of a story on pulsars she'd sent him. He continued that he didn't see the article again until it appeared in print, and he was really impressed. "She got all the nuances right. She must be really good. I admire her."

Toni

# CATALYSIS AND SURFACE SCIENCE

**Modern surface physics is transforming the black art of catalysis, revealing a fascinating choreography followed by reacting atoms and molecules.**

Gerhard Ertl and Hans-Joachim Freund

In 1835 the Swedish chemist Jöns Jakob Berzelius coined the term "catalysis" to describe chemical reactions in which progress is affected by a substance that is not consumed in the reaction and hence is apparently not involved in the reaction. Both the term and the phenomenon were heavily debated throughout the rest of the 19th century until the German chemist Wilhelm Ostwald proposed a now generally accepted definition: "A catalyst is a substance that accelerates the rate of a chemical reaction without being part of its final products." The catalyst acts by forming intermediate compounds with the molecules involved in the reaction, offering them an alternate, more rapid path to the final products.

Catalysis is of vital importance. In biological systems, enzymes play a catalytic role. In the chemical and petroleum industries, key processes are based on catalysis. And in environmental chemistry, catalysts are essential to breaking down pollutants such as automobile and industrial exhausts.

If the catalyst and the reacting species are in the same phase (for example, liquid), then the process is known as homogeneous catalysis. More relevant in technical processes is heterogeneous catalysis, where the catalyst is a solid and the reacting molecules interact with its surface from the gaseous or liquid phases.[1] The economic significance of heterogeneous catalysis is reflected in the fact that the worldwide market for solid catalysts in the automotive, petroleum and other industries is on the order of $100 billion per year and growing rapidly.[2]

Typically, the chemical transformation occurs in a flow reactor through which the reacting species pass. Atoms in the surface of the catalyst may form chemical bonds with atoms in impinging molecules, a phenomenon known as chemisorption. If existing bonds in the molecule break, the process is called dissociative chemisorption. The chemisorbed species are mobile on the surface and may bond to other particles, thus leading to new molecules, which eventually leave the surface (desorb) as the desired reaction products.

Detailed identification and characterization of these elementary processes is hampered, however, by fundamental problems. The reacting systems exist merely as two-dimensional phases for which most of the usual methods of investigation are not well suited, and so researchers have had to develop novel surface-sensitive tools. (See the box on page *****.) Furthermore, the surfaces of "real" catalysts are typically rather inhomogeneous. Because their efficiency increases with their total surface area (as long as no diffusion or other limiting transport process is required), finely divided particles are usually applied to a more-or-less inert support material. (See figure 1.) Catalytic activity is often further enhanced by the addition of compounds called promoters.

GERHARD ERTL *is director of the department of physical chemistry, and* HANS-JOACHIM FREUND *is director of the department of chemical physics, at the Fritz Haber Institute of the Max Planck Society in Berlin.*

## Making ammonia

The synthesis of ammonia ($NH_3$) from the elements nitrogen ($N_2$) and hydrogen ($H_2$) represents the first—and still one of the most important—large-scale industrial processes based on heterogeneous catalysis.[3] This reaction was first realized in 1909 by Fritz Haber, on a laboratory scale. Only four years later, due mainly to work performed by Carl Bosch and Alwin Mittasch, the first industrial plant of Badische Anilin und Soda-Fabrik, one of today's big chemical companies, started operations. Currently, 150 million tons of ammonia are produced per year worldwide, most of which is converted into fertilizer.

The catalyst developed by Mittasch was essentially iron with small amounts of potassium, aluminum and calcium added as promoters. With only minor modification, it is still in use in most ammonia-producing plants. It is only in recent years that catalysts based on supported ruthenium particles with alkali metal promoters have emerged as possible alternatives; they were first proposed by Japanese researchers.

Despite its great complexity, the mechanism of this important reaction can now be regarded as known. The reaction rate can be successfully modeled on the basis of the kinetics of the elementary steps involved, as figure 2 illustrates.[4]

The necessary information was obtained largely by surface science modeling. An actual catalyst is complex, consisting of small solid particles supported on oxide powders exposing various crystal planes, usually with poorly defined composition and morphology. Consequently, model systems must be developed. By "model," we mean real but simple systems. The simplest model system would be a well-defined single crystal surface whose structure may be varied by choosing different surface orientations. Furthermore, by introducing defects and by modifying the crystal's chemical composition, the morphology of the surface may be changed to bridge the material gap between the models and the actual catalyst.



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Steve —
Ertl and Freund are pleased, — Jeff

(To Benka, 24Nov98)

**From:** HJ Freund <freund@fritz-haber-institut.mpg.de>
**To:** ACP.AIP(JSCHMIDT)
**Date:** Tue, Nov 24, 1998 3:09 am
**Subject:** Physics Today

Dear Dr. Schmidt,
thank you for sending the proofs of the joint paper with Gerhard Ertl. In general we feel that you have done a great job in smothing our english without changing the substance of the paper. Thank you!
1. Question on first page: Physical chemistry (Ertl), chemical physics (Freund) is correct!!
2. In the caption of figure 1, second sentence: instead of" single-crystal oxide surface" please use "single-crystal surfaces of thin oxides films supporting...".
With best regards
Hajo Freund

---

Hajo Freund
Director, Department CHEMICAL PHYSICS
Fritz-Haber-Institut der Max-Planck-Gesellschaft
Faradayweg 4-6, 14195 Berlin, Germany
Tel. +49-30-8413-4100
Fax. +49-30-8413-4101
e-mail: freund@fhi-berlin.mpg.de
Secretary: Karin Klug, Tel: +49-30-8413-4104,
klug@fhi-berlin.mpg.de
Gabriele Mehnert, Tel: +49-30-8413-4102,
mehnert@fhi-berlin.mpg.de

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Hajo Freund
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Fritz-Haber-Institut der Max-Planck-Gesellschaft
Faradayweg 4-6, 14195 Berlin, Germany
Tel. +49-30-8413-4100
Fax. +49-30-8413-4101
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Secretary: Karin Klug, Tel: +49-30-8413-4104,
klug@fhi-berlin.mpg.de
Gabriele Mehnert, Tel: +49-30-8413-4102,
mehnert@fhi-berlin.mpg.de

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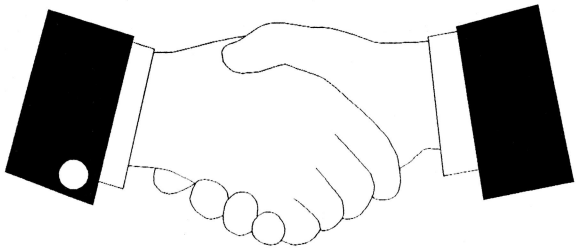
AMERICAN INSTITUTE OF PHYSICS

**A I P INTER-OFFICE MEMORANDUM**



*To:* *Jeffrey Schmidt*

*From:* *T. C. Braun* TCB *Extension: 2293*

*Date:* *February 8, 1999*

*Subject:* *Perfect Attendance*

*CONGRATULATIONS!!!!! Our records indicate that you had perfect attendance for 1998. In accordance with our present policy, you have earned a cash incentive bonus of $200 (subject to normal payroll taxes) and 2 bonus days. The bonus days must be taken within the year and may not be carried over into 2000. You will receive a separate check on payday, ~~25 February 1999~~. We thank you for your perfect attendance and wish you another healthy year in 1999.*

17 JUNE 99

**From:** Stephen Benka
**To:** Barbara Levi, Bert Schwarzchild, Charles Day, E...
**Date:** Wed, Jul 14, 1999 1:38 PM
**Subject:** ASA cites PT articles

I just learned that the Acoustical Society of America's "Science Writing Award to a Professional" went to Ilene Busch-Vishniac for her July 1998 article in PT, "Trends in Electromechanical Transduction." Jeff was the editor.

The previous such award from the ASA went to Mathias Fink for his March 1997 article in PT, "Time-Reversed Acoustics." Bert was the editor.

Well done, and well earned.

--Steve

**CC:** Dr. James Stith, Gary Squires, Jeff Bebee, Marc...

**Mail Envelope Properties** (378CCAEF.9F5 : 22 : 40788)

**Subject:** ASA cites PT articles
**Creation Date:** Wed, Jul 14, 1999 1:37 PM
**From:** Stephen Benka

**Created By:** ACP.AIP:SBENKA

**Recipients**
Post Office ACP.AIP
BLEVI (Barbara Levi)
BRODSKY CC (Marc Brodsky)
BSCHWARZ (Bert Schwarzchild)
CDAY (Charles Day)
EPLOTKIN (Elliot Plotkin)
GLUBKIN (Gloria Lubkin)
GSQUIRES CC (Gary Squires)
JBARKER (Judy Barker)
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JKUMAGAI (Jean Kumagai)
JSCHMIDT (Jeff Schmidt)
JSTITH CC (Dr. James Stith)
MDSMITH (Marian Smith)
PELLIOT (Paul Elliot)
RFITZGER (Richard Fitzgerald)
RWEHRENB (Rita Wehrenberg)
SBENKA (Stephen Benka)
SQUARLES (Sharon Quarles)
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TGARY (Tonya Gary)
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**Options**
**Expiration Date:** None
**Priority:** Standard

**From:** Jerry Bernholc <bernholc@ncsu.edu>
**To:** "Jeff Schmidt" <jschmidt@aip.acp.org>
**Date:** Fri, Jul 30, 1999 12:11 PM
**Subject:** proofs

Hi Jeff --
You did a great job editing the article! Thank you very, very much!

I went carefully through the proofs and have only very minor changes to suggest. As you requested, I am putting it all into email so that it is easy to forward to the appropriate person.
I will get to the caption soon and you will have it by Monday morning.

-- Jerry

---

1. p. 24, left panel, move the superscript 1 to the end of the fifth line from the bottom, i.e., this line should end with "(DFT),1" and the superscript "1" should be removed from the first line of the right panel.
2. p. 24, right panel, add "(see figure 1)" in the middle paragraph after "new solid C60" Do not add "(See figure 1.)" at the end of this sentence, as currently marked on the proofs.
3. Page 25 top line left (optional change). Change "That process" to "This process"
4. Page 25, marks in margin. Change "* , page 40.)" to "* , page 40, and ref. 4.)" Remove the superscript 4 at the end of the previous sentence.
5. Page 25, close to bottom, left panel. It says before the enumeration: "plane waves can be used as a basis set." The next sentence starts with "Using them" The following sentence also says "* using them makes the results". "Using them" is repeated too many times, and maybe this can be changed.
6. Page 26 left panel, second paragraph, second sentence. Replace "and it has been possible" with "but Alex Seattle's group (also at Berkeley) was able"
7. Page 27, left panel, second paragraph, first word (optional change). Change "That" to "This"
8. Page 28, right panel, second paragraph. Move superscript "10" to after "the grid based methods"
9. Page 28, left panel, second paragraph, third sentence. Change "However, because nanotubes" to "However, because currently made nanotubes"
10. Page 28, left panel, second paragraph, fourth sentence. Change "forthcoming" to "available at the time"
11. Page 29, caption to figure 5, last sentence. Change "researchers" to "Fattebert and Marco Buongiorno Nardelli"
12. Page 29, left panel, line 10. Change "his coworkers" to "Mark Hybertsen"

Regarding changes 3 and 7 ("that" vs. "this"), we may have a difference of opinion. Since I was not born in this country, I asked my wife, who long time ago was a technical copy editor for Plenum. (She is a biostatistician now.) She also liked "this" better. However, I am leaving the final decision to you.

**From:** "Jeff Schmidt" <jschmidt@aip.acp.org>
**To:** ACP.AIP(sbenka)
**Date:** Tue, Aug 3, 1999 11:50 AM
**Subject:** The Bernholc article

Steve --

Thank you for checking the Bernholc article promptly. I'm glad you liked it. Jerry Bernholc was pleased, too (see below).

-- Jeff

---

>>> Jerry Bernholc <bernholc@ncsu.edu> 07/30 12:11 PM >>>

Hi Jeff --

You did a great job editing the article! Thank you very, very much!

I went carefully through the proofs and have only very minor changes to suggest....

**CC:** ACP.AIP(JSCHMIDT)

# GRAVITATIONAL RADIATION AND THE VALIDITY OF GENERAL RELATIVITY

**Observing the speed, polarization, and back influence of gravitational waves would subject Einstein's theory to new tests.**

Clifford M. Will

While the detection of gravitational radiation may usher in a new era of "gravitational wave" astronomy (see the accompanying article by Barry Barish and Rainer Weiss, on page *****), it should also yield new and interesting tests of Einstein's general theory of relativity, especially in the radiative and strong-field regimes. Consequently, we are in an unusual situation. After all, we rarely think of *electromagnetic* astronomy as providing tests of Maxwell's theory. Neutrino astronomy may be a closer cousin: We can observe neutrinos to learn about the solar interior or about supernovae, while also checking such fundamental phenomena as neutrino oscillations. To some extent, the usefulness of astronomical observations in testing fundamental theory depends upon how well tested the theory is already. At the same time, since general relativity is the basis for virtually all discussion of gravitational-wave detectors and sources,[1] the extent of its "upfront" validity is of some concern to us.

Although the empirical support for the theory of general relativity is very strong, it is still not as solid as the support for Maxwell's theory, and only in the last 35 years or so have precise tests been feasible. Furthermore, general relativity has not been tested deeply either in its radiative regime or in the regime of strong gravitational fields, such as those associated with black holes or neutron stars. (See figure 1.) Most tests, such as those carried out in the Solar System, check the theory only in its weak-field, slow-motion, nonradiative limit. One famous exception, the Hulse–Taylor binary pulsar, does provide an important verification of the lowest-order radiative predictions of general relativity and is sensitive to some strong-field aspects. Still, important tests of gravitational radiation and its properties remain undone. Furthermore, interesting, well-motivated alternative theories to general relativity still exist that are in agreement with all observations to date. Gravitational-wave tests will remain of interest to us to the extent that they can further constrain the theoretical possibilities.

There are three aspects of gravitational radiation that can be subjected to testing:

▷ The polarization content of the waves (general relativity predicts only two polarization states, whereas other theories predict as many as six).

▷ The speed of the waves (general relativity predicts a speed the same as that of light, whereas other theories predict different speeds).

▷ The back influence of the emitted radiation on the evolution of the source.

In this article, we discuss the three possibilities. First, though, we review the current status of tests of general relativity.[2,3]

CLIFFORD WILL *(cmw@wuphys.wustl.edu) is chair of the physics department, and a member of the McDonnell Center for the Space Sciences, at Washington University in St. Louis, Missouri.*

## The Einstein equivalence principle

At the heart of gravitational theory is a concept called the Einstein equivalence principle, which modernizes Newton's postulate of the equivalence of gravitational and inertial mass. It states first, that bodies fall with the same acceleration regardless of their internal structure or composition (this piece of the Einstein equivalence principle is called the weak equivalence principle), and second, that the outcome of any local nongravitational experiment is both independent of the velocity of the free-falling reference frame in which it is performed (local Lorentz invariance) and independent of where and when in the universe it is performed (local position invariance).

The Einstein principle implies that gravitation must be described by a theory in which matter responds only to the geometry of spacetime. Such theories are called metric theories. General relativity is a metric theory of gravity, but so are many others, including the "scalar–tensor" theory of Carl Brans and Robert Dicke, a theory based on earlier work by Paul Jordan. Strangely enough, string theory—a leading contender for a unified theory of particle interactions and for a quantum theory of gravity—does not strictly satisfy the metric theory definition. In string theory, matter can respond weakly to gravitation-like fields, in addition to responding to geometry. Consequently, testing the Einstein equivalence principle is a way to search for new physics beyond standard metric gravity.

To test the weak equivalence principle, we can compare the accelerations $a_1$ and $a_2$ of two bodies of different composition in an external gravitational field. The resulting measurements will yield the difference in acceleration divided by the average acceleration, $2|a_1 - a_2|/|a_1 + a_2|$, called the Eötvös ratio after Roland, Baron Eötvös of Vásárosnamény, whose pioneering tests of the weak equivalence principle at the turn of the century formed a foundation for general relativity.

The best test so far of the weak equivalence principle has been a series of experiments carried out at the



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To test the weak equivalence principle, we can compare the accelerations $a_1$ and $a_2$ of two bodies of different composition in an external gravitational field. The resulting measurements will yield the difference in acceleration divided by the average acceleration, $2|a_1 - a_2|/|a_1 + a_2|$, called the Eötvös ratio after Roland, Baron Eötvös of Vásárosnamény, whose pioneering tests of the weak equivalence principle at the turn of the century formed a foundation for general relativity.

The best test so far of the weak equivalence principle has been a series of experiments carried out at the



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**From:** "Clifford M. Will" <cmw@howdy.wustl.edu>
**To:** ACP.AIP(JSCHMIDT)
**Date:** Tue, Aug 31, 1999 1:57 PM
**Subject:** My Article

Jeff:

The article looks great! Thanks. Below are my comments:

[convention: x.y.z means page x, column y, line z; -z means z from the bottom]

38.2.2: should read ``whereas other theories may predict different speeds.'' The ``may'' is important.

39.1.-9: ``clock anisotropy'' is incorrect in this context. How about ``The best test of this principle to date ...'', or ``The best test of local position invariance to date ...'', or simply ``The best test to date...''. Your choice.

39.2.9 and 39.2.13: Why no ``The'' in PPN formalism? Everybody says ``The PPN formalism''. It sounds strange without the ``the''.

40.1.1: should read ``ranging, planetary and satellite tracking tests'' -- delete the comma after planetary.

42.2.35: change to ``and the European instrument known as VIRGO''

42.2.19: To answer the question, the strong/weak issue in duality in string theory is a different one than here. I believe that the use of ``only'' in this context is a safe one.

42.2.References: I believe that the SLAC proceedings are to be published by SLAC itself as a report, not by a standard book publisher. If this means using the terminology ``unpublished'', fine.

My only serious problem is with the rendition of Figure 5. The inspiral waveform on the left of the merger does not show the required increase of frequency, which is crucial, and also appears asymmetrical about the horizontal axis. The correct curve (apart from overall scale) can be generated simply from the formula (which happens to be the correct, lowest-order formula):

f(t)=(-50-t)^(-1/4)*cos(2*(-50-t)^(5/8));

and then plotted from t=-500 to t=-51.

A simple Maple program to do this, as well as to plot the Ringdown waveform is reproduced below:

```
f:=t->(-50-t)^(-1/4)*cos(2*(-50-t)^(5/8));
g:=t->0.6*exp(-(t-50)/40)*cos((t-50)/10);
with(plots):
p1:=plot({f(t)},t=-500..-51,linestyle=0,thickness=2,color=red):
p2:=plot({g(t)},t=50..200,linestyle=0,thickness=2,color=red):
```

plots[display]({p1,p2},axes=none);

An artist could then trace over the curves, if necessary. I'm sorry to do this, but every reader who knows about this subject will take one look at Fig. 5 and say ``Wrong!''. I've also attached a postscript file of the curves generated by these formulas.

Has a cover picture been selected for the issue? If it relates to LIGO, I might choose to order offprints with the magazine cover. If not, I would opt for the generic cover.

Thanks again!
Cliff

**CC:** "Clifford M. Will" <cmw@howdy.wustl.edu>

**From:** "Jeff Schmidt" <jschmidt@aip.acp.org>
**To:** ACP.AIP(sbenka)
**Date:** Mon, Sep 27, 1999 3:43 AM
**Subject:** Compliment from Jerry Bernholc

Steve --

I got this nice note from Jerry Bernholc.

-- Jeff

---

>>> Jerry Bernholc <bernholc@ncsu.edu> 09/26/99 04:15pm >>>

Thank you very much for your help with the article and for your excellent editing job! I have already received quite a few nice comments. A number of people remarked that it was very well written.

**CC:** ACP.AIP(JSCHMIDT)

**From:** Stephen Benka
**To:** Jeff Schmidt
**Date:** Mon, Sep 27, 1999 11:02 AM
**Subject:** Re: Compliment from Jerry Bernholc

It's a good feeling, isn't it? He sent me a nice note as well.

>>> Jeff Schmidt 09/27 3:43 AM >>>
Steve --

I got this nice note from Jerry Bernholc.

-- Jeff

---

>>> Jerry Bernholc <bernholc@ncsu.edu> 09/26/99 04:15pm >>>

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Jeff, this article is very good—
you've brought it a long way. —Steve

2ND pages
16 Nov. 99

SB
11/17/99

# MOTILE BEHAVIOR OF BACTERIA

**_E. coli_, a self-replicating object only a thousandth of a millimeter in size, can swim 35 diameters a second, taste simple chemicals in its environment, and decide whether life is getting better or worse.**

Howard C. Berg

*Escherichia coli* is a single-celled organism that lives in your gut. It is equipped with a set of rotary motors, each of which is only 45 nm in diameter and drives a long, thin, helical filament that extends several cell body lengths out into the external medium. The assemblage of motor and filament is called a flagellum. The concerted motion of several flagella enables a cell to swim. A cell can move toward regions that it deems more favorable by modulating the direction of rotation of its flagella. It does this modulation by measuring changes in the concentrations of certain chemicals in its environment (mostly nutrients) and deciding whether life is getting better or worse. Thus, in addition to rotary engines and propellers, *E. coli*'s standard accessories include particle counters, rate meters, and gear boxes. This microorganism is a nanotechnologist's dream. Let us examine the features that make it so, from the perspectives of several scientific disciplines: anatomy, biology (genetics), chemistry, and physics.

What made the discovery of *E. coli* and its properties possible? The tale has two geneses. One involves light microscopy and begins in the 17th century, when Antoni van Leeuwenhoek first observed swimming bacteria.[1] (See box 1.) The other involves molecular genetics and begins in the 20th century, when Joshua Lederberg demonstrated that bacteria have sex, as evidenced by their genetic recombination.[2] (See box 2.) Lederberg studied *E. coli* and *Salmonella typhimurium*, two closely related organisms. They are the principal subjects of work now being done on bacterial chemotaxis (the motion of bacteria toward chemical attractants or away from chemical repellents). That work has yielded an important model for understanding organisms' behavior at the molecular level.

## Anatomy of *E. coli*

*E. coli* (like *S. typhimurium*) is a cylindrical organism with hemispherical endcaps (as figure 1 shows). The cell, which weighs only 1 picogram, is about 70% water. Some strains are flagellated and motile; others are nonflagellated and nonmotile. When motile cells are grown in a rich medium (such as salts plus a mixture of amino acids), they swim in the direction of their long axis at a rate of about 35 diameters per second, often changing course but rarely stopping.

The chromosome of *E. coli* consists of a single double-stranded chain of DNA about 700 times longer than the body of the cell. There are 4 639 221 base pairs specifying 4288 genes, most of which encode proteins.[3] The functions of only about 60% of these genes are known. About 50 different kinds of proteins are required to produce the cell's chemotaxis, roughly half for the assembly of flagella and half for behavioral control.

When *E. coli* grows, it first gets longer and then divides in the middle. In a sense it is immortal, because the mother cell is replaced by two daughters, essentially identical to the daughters of the previous generation. The molecules of DNA in the members of a given set of descendants are identical except for mutations, which occur spontaneously for a given gene, at the rate of about $10^{-7}$ per generation.

If well fed and held at the temperature of the human gut (37 °C), *E. coli* can synthesize and replicate everything it needs to make a new copy of itself in about 20 minutes. Thus, if we start at noon today with one cell (and lots of food), by noon tomorrow there will be $2^{72} = 4.7\times10^{21}$ cells—enough to pack a cube 17 meters on a side! This replication rate explains why single cells dispersed on the surface of the hard form of nutrient agar soon become mounds of cells (colonies) a millimeter or so in diameter and why, in soft agar, the motile progeny of a single cell soon populate the entire plate.

## Genetic analysis

A fully functional cell line, or strain, found in the wild is called a wild type. If a mutant cell is found that is missing a particular function, the gene carrying the mutation is named for that missing function. For example, a *che* gene is one encoding a protein (polypeptide) required for *che*motaxis. A cell with such a defect develops flagella and swims, but it does not respond normally to chemical stimuli. The first gene of this type to be identified is called *cheA* (in italics), the second is called *cheB*, and so on through the alphabet. When the protein encoded by the gene is identified, it is called CheA (capitalized and in roman type).

In bacterial chemotaxis, besides the *che* genes, we encounter *fla* genes, so named for their defects in the synthesis of *fla*gella (these genes are now called *flg*, *flh*, *fli*, or *flj*, because there turned out to be more than 26). There are also *mot* genes, named for defects in motility, or generation of torque. And there are a variety of genes that specify specific chemoreceptors; one, for example, *tar*, is a gene encoding the chemoreceptor Tar, which is so named because it mediates taxis toward the amino acid aspartate and away from certain repellents. The soft-agar plate shown in box 2 was inoculated with wild-type cells at the top, cells of a *tsr* (the *s* stands for serine) strain at the right, cells of a *tar* strain at the bottom, and cells of a smooth-swimming *che* strain at the left.

HOWARD BERG *is a professor of molecular and cellular biology, and of physics, at Harvard University in Cambridge, Massachusetts, and a member of the Rowland Institute for Science.*



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2ND pages 16 Nov. 99

SB 11/17/99

Note from editor of Physics Today

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This can open on either a right or left-hand page.

Another excellent article! —Steve 11/23/99

First pages 23 Nov. 99

# PHYSICS AND THE INFORMATION REVOLUTION

## Quantum physics holds the key to the further advance of computing in the postsilicon era.

Joel Birnbaum and R. Stanley Williams

In the fourth century BC, a young man named Pythias was condemned to death by Dionysius, the tyrant of Syracuse, for plotting against him, but Pythias was granted three days' leave to go home to settle his family's affairs after his friend Damon agreed to take his place and be executed should Pythias not return. Pythias encountered many problems but managed to return just in time to save Damon. Dionysius was so struck by this remarkable and honorable friendship that he released them both.

The decades-old friendship between computer technology and physics has also been a remarkable and honorable one, and it, too, has produced salutary results. Present-day experimental and theoretical physicists depend on computing, and have incurred a debt that they have repaid many times over by making fundamental contributions to advances in hardware, software, and systems technologies. (Figure 1 shows an experimental computer and one of its developers.)

In this article, we discuss the physical and economic limits to the geometrical scaling of semiconductor devices that has been the basis of much of the computer industry's progress over the last 50 years. We then look at some of the options that may be available when we come up against fundamental physics barriers sometime after 2010.

## Disruptive technology

The first stored-program electronic computer, ENIAC (the Electronic Numerical Integrator and Computer), was built in 1946. A major triumph for vacuum-tube technology, ENIAC could add 5000 numbers in one second. At that rate, it could calculate the trajectory of an artillery shell in only 30 seconds, whereas an expert human with a mechanical calculator would have needed some 40 hours to complete the task. The machine was large (see figure 2)—and expensive. ENIAC . . .

- ▷ Contained 17 468 vacuum tubes
- ▷ Weighed 60 000 pounds
- ▷ Occupied 16 200 cubic feet
- ▷ Consumed 174 kilowatts (233 horsepower)

The amount of energy ENIAC expended to compute a single shell trajectory was comparable to that of the explosive discharge required to actually fire the shell. ENIAC was still the fastest computer on Earth nine years later, when it was turned off because the US Army could no longer justify the expense of operating and maintaining it.

JOEL BIRNBAUM *is chief scientist at Hewlett-Packard, in Palo Alto, California.* STANLEY WILLIAMS *is *****"a" or "the"?***** senior principal laboratory scientist at Hewlett-Packard Laboratories.*

Even in the early days of ENIAC, though, technologists dreamed of smaller, faster, and far-more-reliable computers. An article by a panel of experts in the March 1949 issue of *Popular Mechanics* confidently predicted that someday a computer as powerful as ENIAC would contain only 1500 vacuum tubes, weigh only 3000 pounds, and require a mere 10 kilowatts of power to operate. Such a machine would be about the size and weight of an automobile, said the experts, with power consumption to match. What was intended to be a bold projection seems quaintly conservative to us now. These days, a palmtop computer is thousands of times more powerful than the ENIAC was.

The reason for the experts' now-laughable error is that their prediction was based on the wrong foundation—reasonable extrapolation of the in-place vacuum-tube technology. The transistor, which had already been invented and represented a disruptive technology—that is, a technology that could totally displace vacuum tubes in computers, as electronic calculators later replaced slide rules—was completely ignored.

By 1949, after 40 years of development, vacuum-tube technology was mature, and the associated manufacturing infrastructure was enormous. In 1938 the vacuum tube had still been a decade away from its ultimate accomplishment. But already there was a significant search for something that would be better: a solid-state switch. The development of that switch required a great deal of basic research, both in materials purification and in device concepts.

Even though transistors as discrete devices had significant advantages over vacuum tubes and progress on transistors was steady during the 1950s, the directors of many large electronics companies believed that the vacuum tube held an unassailable competitive position.

Their companies were eventually eclipsed by the ones that invested heavily in transistor technology R&D and that were poised to exploit new advances. As we shall see, there are eerie parallels with the situation today.

## Moore's law

Gordon Moore of Intel Corp was the first to quantify the steady improvement in gate density when he noticed that the number of transistors that could be built on a chip increased exponentially with time. (See figure 3.) Over the past 24 years, that exponential growth rate has corresponded to a factor-of-four increase in the number of bits that can be stored on a memory chip in every device generation of about 3.4 years—an increase of 16 000 times!

This exponential growth in chip functionality is closely tied to the exponential growth of the chip market,



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This can open on either a right or left-hand page.

Another excellent article! —Steve 11/23/99

First pages 23 Nov. 99

Note from editor of Physics Today (Schmidt's supervisor)

# PHYSICS AND THE INFORMATION REVOLUTION

## Quantum physics holds the key to the further advance of computing in the postsilicon era.

Joel Birnbaum and R. Stanley Williams

In the fourth century BC, a young man named Pythias was condemned to death by Dionysius, the tyrant of Syracuse, for plotting against him, but Pythias was granted three days' leave to go home to settle his family's affairs after his friend Damon agreed to take his place and be executed should Pythias not return. Pythias encountered many problems but managed to return just in time to save Damon. Dionysius was so struck by this remarkable and honorable friendship that he released them both.

The decades-old friendship between computer technology and physics has also been a remarkable and honorable one, and it, too, has produced salutary results. Present-day experimental and theoretical physicists depend on computing, and have incurred a debt that they have repaid many times over by making fundamental contributions to advances in hardware, software, and systems technologies. (Figure 1 shows an experimental computer and one of its developers.)

In this article, we discuss the physical and economic limits to the geometrical scaling of semiconductor devices that has been the basis of much of the computer industry's progress over the last 50 years. We then look at some of the options that may be available when we come up against fundamental physics barriers sometime after 2010.

## Disruptive technology

The first stored-program electronic computer, ENIAC (the Electronic Numerical Integrator and Computer), was built in 1946. A major triumph for vacuum-tube technology, ENIAC could add 5000 numbers in one second. At that rate, it could calculate the trajectory of an artillery shell in only 30 seconds, whereas an expert human with a mechanical calculator would have needed some 40 hours to complete the task. The machine was large (see figure 2)—and expensive. ENIAC . . .

- ▷ Contained 17 468 vacuum tubes
- ▷ Weighed 60 000 pounds
- ▷ Occupied 16 200 cubic feet
- ▷ Consumed 174 kilowatts (233 horsepower)

The amount of energy ENIAC expended to compute a single shell trajectory was comparable to that of the explosive discharge required to actually fire the shell. ENIAC was still the fastest computer on Earth nine years later, when it was turned off because the US Army could no longer justify the expense of operating and maintaining it.

JOEL BIRNBAUM *is chief scientist at Hewlett-Packard, in Palo Alto, California.* STANLEY WILLIAMS *is ******"a" or "the"?***** senior principal laboratory scientist at Hewlett-Packard Laboratories.*

Even in the early days of ENIAC, though, technologists dreamed of smaller, faster, and far-more-reliable computers. An article by a panel of experts in the March 1949 issue of *Popular Mechanics* confidently predicted that someday a computer as powerful as ENIAC would contain only 1500 vacuum tubes, weigh only 3000 pounds, and require a mere 10 kilowatts of power to operate. Such a machine would be about the size and weight of an automobile, said the experts, with power consumption to match. What was intended to be a bold projection seems quaintly conservative to us now. These days, a palmtop computer is thousands of times more powerful than the ENIAC was.

The reason for the experts' now-laughable error is that their prediction was based on the wrong foundation—reasonable extrapolation of the in-place vacuum-tube technology. The transistor, which had already been invented and represented a disruptive technology—that is, a technology that could totally displace vacuum tubes in computers, as electronic calculators later replaced slide rules—was completely ignored.

By 1949, after 40 years of development, vacuum-tube technology was mature, and the associated manufacturing infrastructure was enormous. In 1938 the vacuum tube had still been a decade away from its ultimate accomplishment. But already there was a significant search for something that would be better: a solid-state switch. The development of that switch required a great deal of basic research, both in materials purification and in device concepts.

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# ATMOSPHERIC INFRASOUND

**The search for ways to monitor compliance with the Comprehensive Test Ban Treaty has sparked renewed interest in sounds with frequencies too low for humans to hear.**

Alfred J. Bedard Jr and
Thomas M. Georges

Imagine a world in which you could hear not just nearby conversations and the noise of traffic a few blocks away, but also the sound of blasting in a quarry in the next state, the rumblings of an avalanche or volcano a thousand miles away, and the roar of a typhoon halfway around the world. Fortunately, nature has spared our senses from direct exposure to this incessant din. But our relentless quest to extend our senses has yielded instruments that can do just that—and more. Waves of infrasound, sounds at frequencies too low for us to hear, permeate the atmosphere and offer us insights into natural and human-made events on a global scale.

The term infrasound was coined by following the convention adopted nearly two centuries ago for light waves. The invisible, longer waves below the red end of the visible spectrum were called infrared, and shorter waves beyond the violet end were called ultraviolet. ("Infra" and "ultra" are from the Latin, meaning "below" and "beyond," respectively.) The nominal range of human hearing extends from about 20 Hz to 20 000 Hz, so the inaudible sound waves with frequencies below 20 Hz were dubbed infrasound, while those above the upper limit of 20 000 Hz were named ultrasound. (Many animals can hear beyond the human limits, as described in the box on page *****.) Following the optical convention even further, frequencies just below 20 Hz are known as near-infrasound, and frequencies below about 1 Hz are often called far-infrasound. Near-infrasound, if sufficiently intense, is often felt rather than heard—as you might have experienced when you pass cars equipped with "mega-bass" audio systems.

Interest in atmospheric infrasound peaked during the Cold War as one of several ways to detect, locate, and classify nuclear explosions from global distances. Now, the Comprehensive Test Ban Treaty calls for a more sophisticated global sensor network to monitor compliance.[1] There is a need to ensure that tests of clandestine, low-yield nuclear devices can be detected under conditions of noise, cloud cover, or other masking situations underground, underwater, or in the atmosphere. An integrated global sensor array now being deployed would address this problem by coordinating observations from multiple ground-based sensor types, including seismic, hydroacoustic, and infrasonic arrays, working in concert. (See Jeremiah Sullivan's article on the Comprehensive Test Ban Treaty, PHYSICS TODAY, March 1998, page 24.)

In anticipation of a CTBT monitoring system, infrasound research has returned full circle to its origins. In this article, we review the science and technology of atmospheric infrasound, beginning with a brief history of its Cold War beginnings. Our focus, however, is on the richness of Earth's infrasonic environment, unheard and unknown until instruments were built to detect and record it. Practical applications of this new science are just now being contemplated. (See figure 1, for example.)

## A little history

Pressure waves from very powerful explosions may be detected after traveling several times around the Earth. Two famous pre-nuclear instances were the explosion of the Krakatoa volcano in 1883 and the Great Siberian Meteorite of 1909. Following each of these events, sensitive barometers around the world recorded impulsive pressure fluctuations as traces on paper charts. Later, meteorologists collected these charts from stations around the world and, by comparing arrival times, were able to reconstruct the progress of pressure waves radiating outward from the source at the speed of sound, sometimes passing an observing station two or three times.

But these disturbances pale when compared with the political shock waves from the explosion of the first Soviet atomic bomb in 1949. Cold War fears stimulated a flurry of "remote-sensing" research—much of it classified—to detect and locate nuclear explosions at global distances. Among the technologies explored during those early years of the Cold War were seismic arrays, electromagnetic (radio to gamma-ray) sensors, and arrays of microphones to listen to very-low-frequency sound waves in the atmosphere.

In the early 1950s, a number of institutions contributed to the successful deployment of a global infrasonic monitoring network. Lewis Strauss, in his book, *Men and Decisions*, describes recording low-frequency air waves at the National Bureau of Standards in Washington, D.C., following a 1954 nuclear test in the Pacific. He took the recording to President Eisenhower and played a sped-up version that made the recording audible. Strauss emphasizes the strategic importance, during those early Cold War years, of nuclear intelligence provided by a worldwide monitoring system that included both remote sensing and a radionuclide sampling program.[2]

Early defense-driven infrasound research had multiple foci, including mathematical models for the intensity and spectrum of sound waves generated by various kinds of explosions,[3] how these waves propagate long distances through the atmosphere,[4] what kinds of sensors would be best suited for detecting their signatures,[5] and how those signatures could be extracted from a bewildering variety of natural and human-made infrasonic noise. The Limited Test Ban Treaty of 1963, which prohibits testing of

ALFRED BEDARD *is a research scientist at the National Oceanic and Atmospheric Administration's Environmental Technology Laboratory, in Boulder, Colorado.* THOMAS GEORGES *is a research scientist at the NOAA/Colorado State University Cooperative Institute for Research in the Atmosphere, also in Boulder.*



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**A I P INTER-OFFICE MEMORANDUM**

To: Jeffery Schmidt/Physics Today

From: T. C. Braun TCB Extension: 2293

Date: 11 February 2000

Subject: Perfect Attendance

CONGRATULATIONS!!!!! Our records indicate that you had perfect attendance for the year 1999. In accordance with our present policy, you have earned a cash incentive bonus of $200 (subject to normal payroll taxes) and two bonus days. The bonus days must be taken within the year 2000 and may not be carried over into 2001. You will receive a separate check on payday, 24 February 2000. We thank you for your perfect attendance and wish you another healthy year in 2000.

**From:** "Johnson, Anthony" <johnsona@ADM.NJIT.EDU>
**To:** "'jschmidt@aip.org '" <jschmidt@aip.org>
**Date:** Sat, Apr 8, 2000 5:23 PM
**Subject:** Physics Today article

Dear Jeff:

I now have the galleys and I am quite impressed with how quickly you put together the two pieces. I am also quite happy with the editing of my submission. I only have one question and suggested minor change. The first paragraph of the article: The number of jobs posted that I received from Ed Goldin, shortly after the OFC conference was 2000. Is it safe to assume that the 3400 number that you are using is the updated number and not a typo? If all is well then this is an even more dramatic sign of opportunity in the field and warrants more accentuation. I suggest italics and an exclamation point for the following: " ... 11 jobs per seeker!"

You've done a wonderful job and I have no further changes or comments. I will be visiting the School of Optics at the University of Central Florida on Monday and Tuesday and if you should need to get hold of me for some reason, my hosts are Professors Eric Van Stryland and George Stegeman. The Administrative Assistant at the School of Optics is Sarah Pimentel (Tel: 407-823-6916).

Best Regards,

Anthony

**CC:** "'sbenka@aip.org '" <sbenka@aip.org>, "Crawley, Re...



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2000 **Vice President** of the OPTICAL SOCIETY OF AMERICA (OSA)
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